

1 **2014 NMFS Science Program Review**

2
3 **Chair's Summary¹ of Program Review of Stock Assessment Process**

4
5 Southwest Fisheries Science Center
6 8901 La Jolla Shores Drive, La Jolla, CA 92037
7 28 July – 1 August 2014

8
9 **Review Panel Members**

10 Dan Howard, Sanctuary Superintendent, Cordell Bank National Marine Sanctuary,
11 NOAA, National Ocean Service, Chair
12 Anne Hollowed, Senior Scientist, Leader of the Status of Stocks and Multispecies
13 Assessment Program, Alaska Fisheries Science Center, NOAA Fisheries
14 Samuel Pooley, Director, Pacific Islands Fisheries Science Center, NOAA Fisheries
15 Jake Schweigert, CPS Biologist, Pacific Biological Station, Department of Fisheries and
16 Oceans Canada, retired
17 Nathan Taylor, Conservation Biology Section Head, Pacific Biological Station,
18 Department of Fisheries and Oceans Canada

19
20 We would like to acknowledge and thank Dr. Steve Murawski's participation in
21 preparatory discussions and calls leading up to the review. Unfortunately Steve was
22 unable to attend the review due to a last minute conflict, but his input to the
23 preparation is greatly appreciated.

24
25 **Background and Overview of Meeting**

26 In 2013, annual reviews of science programs at the National Marine Fisheries Service
27 (NMFS) Science Centers (including associated laboratories) and the Office of Science
28 and Technology (ST) were initiated to:

- 29 • Evaluate the quality, relevance, and performance of science and research
30 conducted in NMFS Science Centers and associated laboratories
31 • Strategically position the Science Centers and ST in planning future science and
32 research.

33
34 In 2014, outside review panels were assembled to examine fishery stock assessment
35 programs at each of the Fisheries Science Center's around the country.

36 From July 28 to August 1, 2014, a review panel conducted an evaluation of the stock
37 assessment science program at the Southwest Fisheries Science Center (SWFSC) in
38 La Jolla, California. The purpose of the review was to identify the strengths and

¹ Notes: This report is a summary by the chair NOT consensus. Summarized findings and recommendations should be reported as "Panel members said" NOT "Panel concluded".

1 challenges of the assessment process, and to make recommendations on ways to
2 improve the integrity of the stock assessment program as part of a continuous
3 process of program improvement.

4
5 The first three days of the review consisted of a series of presentations from SWFSC
6 leadership and assessment staff, Northwest Fisheries Science Center leadership, the
7 West Coast Regional Office (WCRO), the Pacific Fishery Management Council (PFMC),
8 national stock assessment advisor, and comments from the public. The fourth day
9 was reserved for follow up conversations between panel members and staff and for
10 panel members to complete draft versions of their review. On Friday, panel members
11 met with SWFSC leadership to present their findings.

12
13 The panel reviewed the stock assessment process for three species groups that are
14 part of SWFSC assessment portfolio: Highly Migratory Species (HMS), Coastal Pelagic
15 Species (CPS), and Groundfish (GF).

16
17 The review focused on the program areas related to the stock assessment process
18 but was not an in-depth review of a particular stock assessment model. The Panel
19 considered materials provided by the Center before and during the review and
20 additional information came to light in the presentations and in the following
21 discussions. The panel also met with stock assessment staff to get additional
22 information not provided as part of their respective presentations. All presentation
23 material (Power Points and background documents) will be available at:

24 <https://swfsc.noaa.gov/2014StockAssessmentReview/>

25
26 The Panel review focused on the seven themes that define the stock assessment
27 program:

- 28 1. Does the Center apply a suitable scientific/technical approach to fishery stock
29 assessment modeling?
- 30 2. Is the assessment process efficient, effective and clearly described, including
31 terms of reference for assessment reports?
- 32 3. Does the Center, in conjunction with other entities such as the Council's
33 Scientific and Statistical Committee (SSC), have an adequate peer review
34 process?
- 35 4. Is the Center's program organization effective at accomplishing needed
36 assessments according to a set of assessment priorities? Include program
37 structure, staffing, and funding; include prioritization of stocks for
38 assessment.
- 39 5. Does the Center achieve adequate assessment accomplishments relative to
40 mandates particularly with respect to the number of Fishery Management

- 1 Plan (FMP) species assessed?
2 6. Does the assessment program adequately communicate their results, needs,
3 and research?
4 7. Are there opportunities for improving stock assessments and the stock
5 assessment process?
6

7 Addition questions were provided by the Center to stimulate thought for each of the
8 seven themes (Appendix 1).
9

10 **General Observations and Recommendations**

11 The panel members said that the review was well organized and thorough, and that
12 information was presented in a logical sequence that provided a comprehensive
13 overview of the SWFSC's stock assessment activities. The staff did an excellent job of
14 providing information describing their respective stock assessment program(s) and
15 in suggesting the challenges they face. They also provided many thoughtful and
16 innovative suggestions on strategies for improving the process. The SWFSC fishery
17 stock assessment staff appear dedicated and passionate and they appear to have the
18 latitude to express themselves freely, which is a compliment for this type of review.
19 It was clear to the panel that SWFSC has a talented and committed staff, and there is
20 a strong effort to complete timely, rigorous assessments and develop new
21 assessment approaches.
22

23 The review benefitted greatly from the participation (and presentations) by the
24 Pacific Fishery Management Council and NOAA Fisheries west coast regional office,
25 and members of the public that included participation from several representatives
26 of commercial fishing organizations and the Inter-American Tropical Tuna
27 Commission (IATTC). The comment from one industry representative that they
28 strongly support the Center's assessment work because it brings the best science to
29 support management is a credit to the integrity of the program.
30

31 Over the course of the first three days, there were issues that were raised multiple
32 times in discussions that crossed boundaries among the seven themes presented in
33 the terms of reference. Below is a **non-consensus summary** produced by the Chair
34 summarizing general observations on a few points that related to several themes.
35

36 **Building Capacity:**

37 In several discussions there was reference to the challenge of finding graduate
38 students, post-docs or young professionals with appropriate quantitative skills to
39 join a stock assessment team.
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Recommendation to address issue:

- 1. Continue to develop partnerships that SWFSC has initiated with universities to leverage university partners through programs like CSTAR, CAPAM and others.
- 2. Utilize NMFS staff currently housed at or near California Universities to mentor quantitative students. This may require senior staff at the Center to participate in classroom instruction and trainings because the set of skills necessary for stock assessment can be highly specialized.
- 3. There is an opportunity to work with University of California (UC) system to develop a quantitative fisheries management core course. The problem is that qualified professors are located at different UC campuses. Center leadership could engage a high level discussion with the UC to propose the formation of a joint teaching program for students interested in quantitative ecology and resource management for fisheries. This course series could be taught through distance learning where possible with perhaps short 1-2 week intense periods of rotational study at the home institution of the lead faculty. The technology has advanced to facilitate this type of distance learning opportunity and this would fill a clear need for the fish assessment programs at the SWFSC.

Staffing:

It was telling that during the presentations it was said that the Center analysts are “one flu season away from disaster”. Accordingly, CPS, GF and HMS groups do seem to need some modifications to align capacity with production. Staff brought it to our attention that this issue was raised in the 2013 data management review. The inability to backfill vacant positions across the assessment programs and recent retirements of key scientists within the GF assessment group has increased the work load for remaining staff.

Organizationally, SWFSC might benefit from a stock assessment program leader, parallel to several other NOAA Fisheries science centers, as a coordinating presence across the three assessment groups and two locations.

Recommendation to address issue:

- 1. The SWFSC should consider hiring a data support person for HMS and CPS stocks. This person would be responsible for compiling data for assessment analysts and he/she could conduct retrospective studies to assess data quality and reliability.
- 2. Continue to backfill GF positions that were vacated by recent retirements.
- 3. Continue HMS trainings to improve stock assessment capabilities of other member countries in international working groups so they can lead some assessments.

1 4. NMFS might consider providing contract funds to recently retired assessment
2 scientists to fill the gap in assessment expertise and to mitigate the workload until
3 qualified replacement scientists can be hired and trained.

4 5. The SWFSC could possibly benefit from a senior level person, potentially the
5 Fisheries division chief or the lead stock assessment program leader, to be the
6 primary liaison with the management bodies. This would help provide a filter for
7 assignments from the management bodies and provide a key person in planning and
8 scheduling secondary work so that it does not impinge on the assessment cycle. The
9 panel understands that fiscal constraints will require prioritizing additions to
10 current staff.

11
12 **International Data Sharing:**

13 Fishery dependent and fishery independent data for CPS and HMS species depend
14 on contributions from other nations. The assessment scientists at SWFSC can't
15 control the timeliness of data delivery from these nations. The analysts spend
16 valuable time collating data series for input into assessments.

17 **Recommendation to address issue:**

18 1. To the extent possible it would be useful for NMFS to work with contributing
19 Nations to establish a data sharing agreement that includes best practices for data
20 collection, estimation of CPUE or survey biomass, and include timelines for delivery
21 of information to assessment analysts.

22 2. HMS staff should continue trainings to improve stock assessment capabilities of
23 other member countries in international working groups so they can lead
24 assessments.

25 3. CPS staff were hopeful that data delivery from Mexico would improve following
26 recent discussions and the commissioning of a new vessel for coastal sampling in
27 Mexico.

28
29 **Federal/State Responsibilities:**

30 How assessment responsibilities are allocated between SWFSC and the state of
31 California for some of the nearshore species is unclear. This includes sampling and
32 analysis for some CPS and GF stocks.

33
34 **Recommendation to address issue:**

35 1. SWFSC should initiate strategic conversation with the state of California to talk
36 about stock assessment responsibilities and priorities for some of the nearshore
37 species. The state may be in a position with an improved economy to resume
38 assessments for some of the inshore stocks that they historically assessed.

1 **Chair’s Summary of Panel Member’s Major Observations and**
2 **Recommendations**

3
4 **Theme I: High-level scientific/technical approach**

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6 ***Observations***

7
8 The SWFSC has a highly trained and productive group of stock assessment
9 scientists. Staff has shown foresight and initiative in developing and applying a
10 suite of techniques to a wide array of species to provide required advice on harvest
11 and rebuilding targets. Note of caution expressed on relying exclusively on stock
12 assessment models for generating OFLs and ABCs.

13
14 ***Strengths***

- 15 • Scientists at the SWFSC are well qualified, and are publishing papers that
16 address cutting-edge issues within the field of stock assessment and resource
17 management. They have introduced novel methods for assessing data
18 moderate and data poor stocks. Scientists have published new approaches to
19 deal with difficult parameter estimation issues as well as model specification
20 to address stock structure.

21 ***Challenges***

- 22 • Catch statistics for groundfish are collected by a variety of entities along the
23 west coast, in general these are uploaded to a central database- Pacific
24 Fisheries Information Network (PacFIN), however, there appears to be a time
25 lag in the delivery of recent catch information. Thus, the analyst needs to
26 track down information that should be readily accessible from a central
27 database.
- 28 • Inevitably there will be a data poor stock that either becomes subject to a
29 developing fishery or a stock that becomes vulnerable to high exploitation
30 due to shifts in target fishery abundance (increased incidental catch) or
31 declines in abundance. It is not clear how these stocks would be transitioned
32 from data poor to data moderate or data rich classifications.
- 33 • The SWFSC staff is faced with some daunting assessment challenges. In
34 particular how to develop methods to deal with time-varying effects
35 including movement, natural mortality and distribution (for all fishery
36 groups) will present major future challenges.

1 ***Recommendations to address issue***

- 2 • The SWFSC should work with staff managing the California Commercial
3 Landings Database (CALCOM) and PacFIN to discuss options for expediting
4 the delivery of data to a centralized database.
- 5 • In years when data poor or data moderate assessments are reviewed, the
6 analysts should update and review the Productivity Susceptibility Analysis
7 (PSA) to ensure that conservation concerns are not emerging. This update
8 could be used to identify stocks where additional investment in the
9 development of reliable fishery dependent or fishery independent indices to
10 improve the quality of the assessment would be beneficial.
- 11 • Initiate development of data-poor assessments for Pacific mackerel,
12 Northern anchovy, Jack mackerel (avg. catch, DCAC, DB-SRA, a4a initiative).
- 13 • Advance some of the simulation activities that the Center has begun in
14 collaboration with others (Carruthers et al. 2014 – see citation at end of
15 Panel member A report). Instead of assessment models, it might be possible
16 to design alternative data-based rules for setting catch levels.

17
18 **Theme II: Assessment process**

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20 ***Observations***

21
22 The PFMC has worked with NMFS to develop a well-defined stock assessment
23 process that includes clear timelines for delivery of assessments, content of
24 assessments, and structures for review for CPS and GF. The assessment process for
25 HMS species is not nearly as well defined.

26
27 ***Strengths***

- 28 • The Benchmark / Full assessments of HMS, CPS and GF utilize sound stock
29 assessment methods and provide clear advice for management bodies.
- 30 • An outline for the preparation of the GF and CPS stock assessments is
31 contained within the GF/CPS Star Panel Terms of Reference. This outline
32 includes the necessary description of the data, model description, and
33 diagnostics needed for a thorough review of the assessment.
- 34 • The International Scientific Committee (ISC) for tuna and tuna like species
35 operations manual provides guidelines for the preparation of assessment
36 reports.

1 **Challenges**

- 2 • The PFMC process for review and rule making creates a situation where
3 harvest recommendations are based on outdated stock status
4 information.
- 5 • Age determinations for historical collections of potentially long lived
6 species could reduce the possibility of mis-specification of the natural
7 mortality rate.
- 8 • Benefits and challenges of using Management Strategy Evaluations (MSE)

9 **Recommendations to address issue**

- 10 • Scientists from the NWFSC and SWFSC should ask the West Coast Regional
11 Office to review options for streamlining the rule making process to ensure
12 that harvest specifications are based on the best available science.
- 13 • Focused effort on aging historic collections of otoliths for long lived species
14 to help with natural mortality estimates.
- 15 • Consider collaborating with university to conduct MSE on one or two
16 fisheries as prototypes, and if successful to assess how widely it might be
17 adopted.

18

19 **Theme III Peer review:**

20

21 **Observations**

22

23 The differences between the CPS/GF assessment approach and the HMS approach
24 are quite stark in terms of the peer review process, although it appears both have
25 adequate review processes in place. GF analysts seem to think current STAR panel
26 process works but panel wondered if other options might be explored that would
27 give analysts more time to evaluate changes recommended by the STAR panel and
28 select best model.

29

30 **Strengths**

- 31 • PFMC peer review process is prescriptive and clearly documented,
32 facilitating the development of standardized assessment documents that are
33 easily scrutinized.
- 34 • The ISC operations manual includes a recommendation for periodic reviews
35 of stock assessments and outlines how reviewers would be selected.
- 36 • SWFSC staff have a significant number of stock assessment publications in
37 peer reviewed journals

1 **Challenges**

- 2 • The PFMC process (STAR panel) for peer review could impose undue stress
3 on the analysts and may not provide the time needed to foster careful and
4 thoughtful completion of the assessment. The process combines a review of
5 data inputs, model structure, and model performance with selection of a
6 preferred model all in one meeting. As noted in the TOR for reviews “*During*
7 *the review meeting, the STAR panel and the STAT should strive to reach a*
8 *consensus on a single base model.*” In discussions with analysts it became
9 clear that analysts sometimes are up all night running new model
10 configurations and they may spend the night in the office to accommodate
11 the STAR panel requests. It is not clear what benefit is derived by inclusion
12 of the requirement of deriving consensus on the base model during the
13 review.

14
15 **Recommendations to address issue**

- 16 • May be some benefit for scientists from the NWFSC and SWFSC to meet with
17 the Council staff and review the current stock assessment review process.
18 The Centers and Council might consider the merits of dropping the need for
19 reaching consensus on base model during the STAR process. This would
20 allow the analyst time to carefully consider the issues and concerns raised
21 during the review and the base model could be selected at a later meeting
22 after the analyst had time to run models and evaluate performance.

23
24
25 **Theme IV Organization and priorities**

26
27 **Observations**

28
29 It appears that scientists in the three stock assessment programs (GF, CPS, HMS)
30 interact sufficiently even though they are in separate locations (La Jolla and Santa
31 Cruz), and GF staff are in close communication with their colleagues at the NWFSC
32 and PFMC.

33 The national prioritization process seems promising for aligning the appropriate
34 level of assessments with different stocks, though there was uncertainty on the
35 panel if this process would increase or decrease the need for benchmark
36 assessments.

37
38 **Strengths**

- 39 • The NMFS has established a prioritization process that will allow science
40 centers to carefully consider the frequency and level of assessments.

- 1 • SWFSC and NWFSC work closely with the PFMC to develop assessment
2 priorities for GF.

3

4 ***Challenges***

- 5 • The relationship between the new NOAA Fisheries stock assessment
6 prioritization process and the Pacific fishery management council
7 assessment cycle will merit attention.
8 • Current prioritization process is somewhat ad-hoc, not always full agreement
9 among participants, greater predictability would facilitate setting priorities
10 for research, aging, and other efforts.

11

12 ***Recommendations to address issue***

- 13 • Maintain close communication with fishery management councils as NOAA
14 Fisheries starts to implement Assessment Prioritization process.
15 • Continue development of a more rigorous prioritization process and
16 identification of target assessment frequencies and types to balance needs
17 with capacity.

18

19

20 **Theme V Accomplishments relative to mandates**

21

22 ***Observations***

23

24 For a small core fishery stock assessment staff (7 principal assessment scientists
25 were identified) at the SWFSC, the workload, through-put, and accomplishments are
26 significant. Both the PFMC and the ISC seem pleased with the output of the SWFSC in
27 each of the three assessment areas. (Appendix 2 and 3)

28

29 ***Strengths***

- 30 • Scientists at the SWFSC are responsible for assessing approximately one
31 third of the west coast groundfish stocks. These assessments have been
32 completed and delivered to the PFMC as required based on the review
33 schedule for any given year.

34

35 ***Challenges***

- 36 • Experience dictates that 10 GF benchmark assessments per year is about
37 maximum with current resources. Ideally, no more than 2 assessments per
38 STAR panel. Evolution of data moderate reviews may help with work load.
39 Caution that adoption of data moderate assessment methods could lead to
40 complacency with respect to monitoring associated biological information
41 regarding stock status (e.g., age composition, length frequency, maturation

1 schedule). These data provide a history of stock status and productivity that
2 may be needed for ecosystem modeling or retrospective fisheries
3 oceanography studies.

- 4 • While ecosystem indicators have been developed and are reported on in the
5 CalCOFI state of the California Current report, there is not a clear link
6 between these indicators and PFMC or ISC harvest policies. Ecosystem effects
7 are known to be very important to many stocks, but difficult to quantify and
8 incorporate into assessments.

9 ***Recommendations to address issue***

- 10 • Better utilization of updates to increase timeliness and throughput, consider
11 other means to improve timeliness of data availability and assessment
12 implementation. Reduce reporting requirements for update assessments.
- 13 • Research on ecosystem indicators should include an attempt to identify
14 thresholds for defining the risk to marine resources. Once defined, analysts
15 should meet to consider when or if the risk of environmental change should
16 be incorporated into existing uncertainty buffers.
- 17 • Foster international collaboration (ISC, PICES, ICES) on climate variability
18 effects on pelagic fish/fisheries and associated ecosystems.

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21 **Theme VI Communication of assessment results and data needs**

22

23 ***Observations***

24

25 The Center does a good job of communicating assessment results and data needs
26 through conventional outreach strategies. There may be opportunities using
27 focused workshops and targeted outreach to educate specific audiences that could
28 be beneficial for the program.

29

30 ***Strengths***

- 31 • Strong communications with industry, PFMC, international organizations and
32 partners, and academia.

33

34 ***Challenges***

- 35 • Limited time/capacity to translate stock assessment results for the public
36 and non-scientific stakeholders.
- 37 • Assessment staff work in different locations yet their research and modeling
38 approaches are transferable. Thus some forum for communication may be
39 needed.

1 ***Recommendations to address issue***

- 2 • The Center’s website pages for the Fisheries Resources division should
3 provide easy links to basic reports, published papers, assessment documents,
4 and the biographies and resumes of the principal fisheries stock assessment
5 staff.
6 • Hold regular “open house” at a PFMC meeting or similar venue, as well as
7 holding meetings such as the SSC at the Center (either the La Jolla or Santa
8 Cruz facilities) that would include targeted orientation to stock assessment
9 methodologies and approach.

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12 **Theme VII Opportunities**

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14 ***Observations***

- 15
16 • When looking at the suite of professors that are working at Universities
17 within the State of California, it is clear that the list includes some of the
18 world’s leaders in fisheries science.
19 • Opportunity for assessment staff to interacting with other sections of NMFS
20 with expertise in environmental monitoring or ecosystem linkages to
21 address increasing requests for MSEs and development of ecosystem models.
22 • Continue assessment work that is supporting decisions that are successfully
23 rebuilding overfished rockfish stocks in the NE Pacific.
24 • Opportunity to work with the state and complete assessments for Northern
25 Anchovy and Pacific Mackerel to better understand their population
26 dynamics as sardine populations decline.

27
28 **Other:**

29
30 ***Observations***

31
32 The SWFSC has done a commendable job of developing partnerships and alliances
33 with a variety of individuals and organizations to enhance its capacity to conduct
34 very quantitative and detailed stock assessments.

35
36 ***Strengths***

- 37 • Long history of robust assessments using reliable tools, including research
38 on ecosystem function and publication of results in scientific journals.
39

1 **Challenges**

- 2 • Avoid “burnout” of analysts working in high pressure environment for
3 extended periods of time.
4 • Incorporation of advanced technologies into assessments that will aid with
5 integrating climate change and ecosystem effects.
6 • Addressing impacts of climate change on the population dynamics of
7 commercially harvested fish stocks.

8
9 **Recommendations to address issue**

- 10 • Provide “sabbaticals” or training opportunities for stock assessment staff of
11 various durations (from as short as 1-2 weeks at another NOAA fishery
12 science center to as long as a semester at an appropriate university).
13 • Attempt to fill vacancies with technical expertise in applied assessment skills
14 (e.g., MSEs, biological oceanographer, ecosystem modeler, climate effects).

15
16
17 **Conclusions:**

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19 This report is a summary of observations and recommendations by panel members
20 but is NOT a consensus statement on behalf of the panel members. The SWFSC
21 appears to be doing a very effective job and operating at a high level meeting
22 the assessment requirements of the PFMC and ISC. The panel felt the SWFSC
23 assessment program was in a bit of a transition period with acting program
24 directors, unfilled positions and vacancies created by recent retirements of
25 senior assessment staff, but current staff should be commended for their hard
26 work and significant accomplishments. If additional resources were available
27 to support stock assessments, the panel placed a high priority on hiring
28 additional staff to fill vacant positions. The SWFSC assessment programs are
29 making critical contributions towards rebuilding eastern Pacific rockfish stocks,
30 understanding environment effects on highly variable CPS stocks, and
31 navigating an international network to better understand and manage HMS.
32 We hope that the recommendations provided by the panel will help the SWFSC
33 evaluate the quality, relevance, and performance of their assessment programs
34 and strategically position the Center to plan future science and research related
35 to their stock assessment programs.
36

1 Appendix 1: Background to the Seven Terms of Reference Supplied by the SWFSC

2
3 The following background questions are provided to stimulate thinking with respect to the
4 themes.

- 5 1. Scientific/technical approach to fishery stock assessment modeling –
 - 6 a. Is the Center using an appropriate suite of analytical methods to meet the
7 regional fishery stock assessment objectives?
 - 8 b. Does the suite of assessment models cover considerations from data-poor
9 to data-rich?
 - 10 c. Are assessments capable of considering possible ecosystem effects?
 - 11 d. Does the Center work on enhancing and testing these analytical methods?
12 Are they keeping with and contributing to the state-of-the-science
13 nationally and internationally?
- 14 2. Is the Center's process for conducting stock assessments efficient and effective?
 - 15 a. Is there an explicit terms of reference for conducting and reporting
16 assessments?
 - 17 b. Do reports provide a complete description of the work and a concise
18 summary?
 - 19 c. Do assessments adequately and incrementally build upon past assessments
20 and reviews?
 - 21 d. Are there clear protocols for delivering draft assessment products to peer
22 reviews?
 - 23 e. Is involvement of assessment scientists in preliminary data preparation and
24 analysis sufficient to utilize their statistical expertise, but not
25 burdensome?
 - 26 f. Are there protocols for consistently dealing with technical issues, as
27 appropriate to the stock, for example: calibration of catchability,
28 consideration of dome-shaped and time- varying selectivity, natural
29 mortality, estimation of stock productivity, characterization of
30 uncertainty, etc.?
 - 31 g. Are there protocols in the assessment process for conducting sensitivity
32 analyses and evaluation of risk?
- 33 3. Peer review process
 - 34 a. What is the relative role of the Center and the Council's Scientific and
35 Statistical Committee (SSC) in organizing and conducting the peer
36 review?
 - 37 b. Are TORs for assessment reviews clear and well defined prior to the
38 assessment? Are they focused on key issues needing review? Are they
39 appropriately, but not excessively, broad in scope? Do they focus the
40 review on key, answerable questions?
 - 41 c. Are major data collection programs and modeling methods reviewed
42 separately from the final review of assessments?
 - 43 d. Are there clear protocols for considering and including input from
44 scientists not on the agency assessment team?
 - 45 e. Does the regional peer review process achieve an appropriate balance
46 between transparency, thoroughness, and throughput?

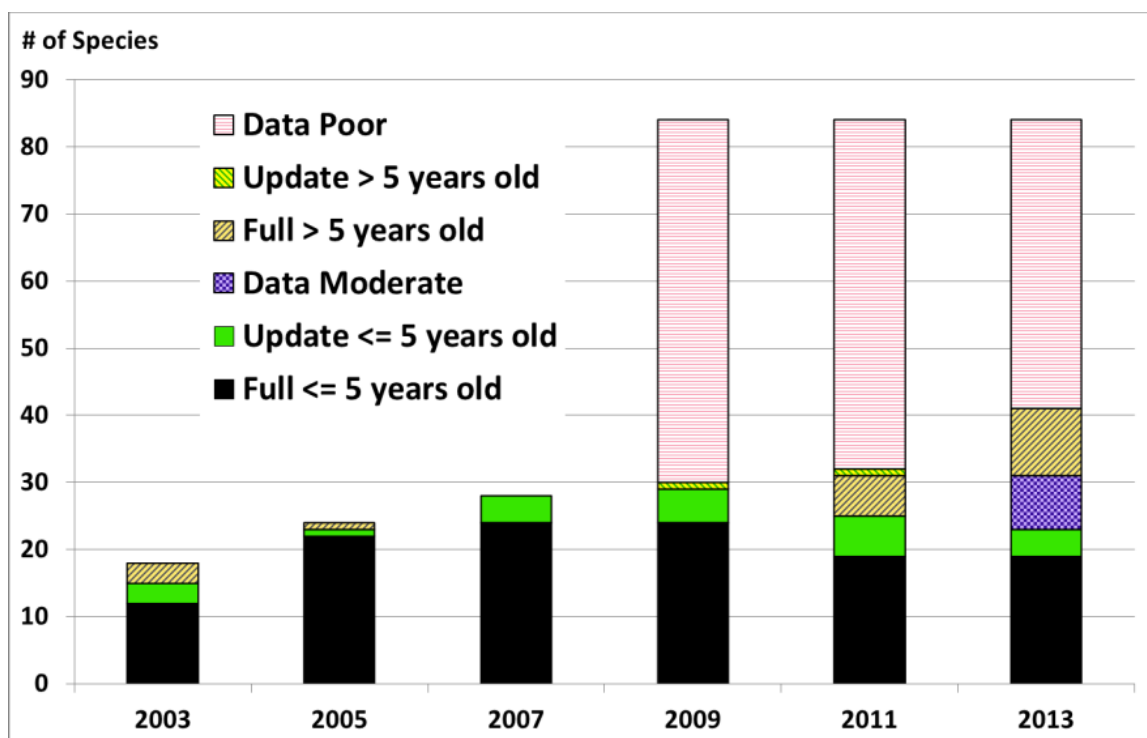
- 1 4. Organization and priorities –
- 2 a. Does the Center/Region schedule stock assessments in a manner that meets
- 3 national standards and regional needs?
- 4 i. What protocols are used to prioritize need, frequency and
- 5 appropriate level of stock assessments?
- 6 ii. Has the Center reasonably balanced Council, other domestic and
- 7 international stock assessment needs as well as additional
- 8 analytical and review demands?
- 9 iii. How well does the Center involve internal and external clients and
- 10 stakeholders in priority setting and the assessment process?
- 11 iv. Are the Center’s scheduling and scale (e.g., benchmark vs.
- 12 updates) for individual fishery stock assessments balanced with
- 13 Center resources, and regional, national and international needs?
- 14 v. What steps are the primary bottleneck in the number and timeliness
- 15 of stock assessments each year: surveys, input data processing and
- 16 management, assembly of assessment reports, ability to address
- 17 questions from previous assessment, availability of assessment
- 18 scientists, and review scheduling? Are any excessively limiting?
- 19 b. Is the Center prioritizing the appropriate initiatives and research areas to
- 20 address current and anticipated stock assessment needs, including
- 21 connection of stock assessments to broader ecosystem investigations?
- 22 5. Accomplishments relative to mandates
- 23 a. How many FMP and non-FMP stocks are being assessed?
- 24 b. Do current and planned fishery stock assessments meet regional, national,
- 25 and international expectations in terms of quality, quantity and timeliness?
- 26 c. How well does the Center attain a prioritized portfolio of baseline
- 27 assessments for all managed stocks (including data-poor) and full
- 28 assessments for important stocks?
- 29 d. How well does the Center consider ecosystem and environmental factors
- 30 affecting fish stocks and their assessments?
- 31 6. Communication –
- 32 a. Are assessment data needs being communicated to survey scientists,
- 33 advanced technology experts, and fisheries-dependent data sources; and
- 34 have improved data resulted from these efforts?
- 35 b. Are assessment process and results adequately communicated to fishery
- 36 managers, affected public and the scientific community?
- 37 7. Opportunities –
- 38 a. Is the Center conducting the research necessary to improve stock
- 39 assessments and produce timely and assessment-relevant scientific
- 40 research products?
- 41 b. Do assessment scientists engage in research published in peer-reviewed
- 42 journals?
- 43 c. Are there areas of expertise that could be added in the future to strengthen
- 44 the ability of the Center to meet its management and research objectives?
- 45 d. Should the Center be taking greater advantage of opportunities for
- 46 collaboration in conducting fishery stock assessments and related research,

1 including shared approaches with other Centers, regional academic
2 partners, other government agency partners, and stakeholders?
3
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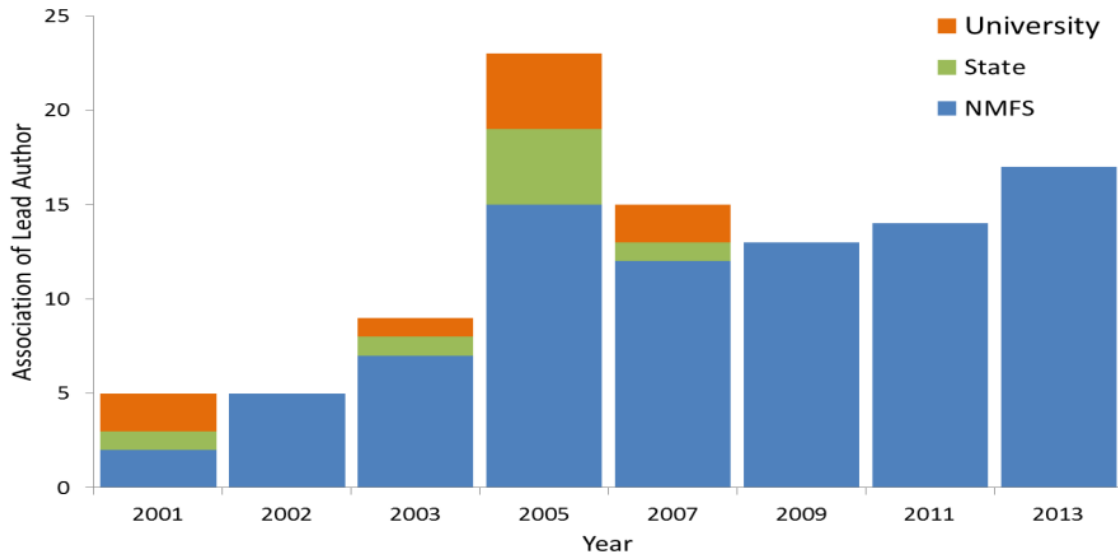
5 **Appendix 2. Number of assessments produced by the SWFSC for Groundfish,**
6 **Coastal Pelagic Species and Highly Migratory Species**

7
8 **Groundfish** (Field, presentation at SWFSC 2014 review)
9

- 10 • Currently ~8-10 full benchmark assessments, 1-3 updates and 4-7 data
11 moderate (plus 50 or more data poor) assessments per biennial cycle
12
- 13 • Number of stocks assessed has increased sharply with application of data-
14 poor and data moderate approaches (all targeted stocks have a rationale for
15 an ACL)
16



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2 Number of benchmark assessments has increased over last decade - except for 2005
3 high water mark

4
5
6 **Coastal Pelagic Species (CPS)** (Hill presentation at SWFSC 2014 review)

- 7
8 • SWFSC conducts ongoing assessments for 2 of 6 species in the CPS FMP:
9 Pacific sardine and Pacific mackerel assessed on regular basis

10
11 **Highly Migratory Species (HMS)** (Hill presentation at SWFSC 2014 review)

- 12
13 • SWFSC conducts ongoing assessments for 3 of 11 species in the HMS
14 FMP:
15 SWFSC (w/ ISC): albacore tuna, bluefin tuna, and blue shark

16
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1
2 **Appendix 3. List of assessment related publications produced by SWFSC stock**
3 **assessment staff, 2010 – 2014.**

4
5 Includes all manuscripts for which an assessment scientist was a coauthor

6
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Panel Member Reviews

Panel Member A

2014 NMFS Science Program Review

Southwest Fisheries Science Center
8901 La Jolla Shores Drive La Jolla, CA 92037-1508
July 28th – August 1st, 2014

Panel Member's Major Observations and Recommendations

High-level scientific/technical approach

Observations

There are both dangers and costs to relying exclusively on stock-assessment models for generating OFLs and ABCs. Although biased estimation is likely also a problem for data-rich assessments (Magnusson and Hilborn 2007), data-poor and data-moderate models may be particularly vulnerable to errors, as work done in collaboration with others at the SWFSC has shown (Carruthers et al. 2014).

Strengths

Ongoing research, including the simulation testing of data-poor and data-moderate approaches is particularly commendable. The Center has made some impressive innovations, in spite of very large analytical demands on its analysts, by engaging in external collaborations. Panel off-year workshops seem like a productive use of time to help advance scholarship already underway.

Challenges

The SWFSC staff is faced with some daunting assessment challenges. In particular, development of methods to deal with time-varying effects, including movement, natural mortality and distribution (for all fishery groups), will present major future challenges. Other major challenges include development of abundance indices and obtaining compositional information for HMS fisheries.

Recommendations to Address Issues

My primary recommendation is to advance some of the simulation activities that the center has begun in collaboration with others. Instead of assessment models, you might be able to design alternative data-based rules for setting catch. Simulation studies show that assessment models may be very unreliable, especially when there is little contrast in the data (Ludwig and Hilborn 1983, Magnusson and Hilborn 2007); this may be especially so if assessments rely on survey series that began well after fisheries were fully developed. Assessments are also costly and time-consuming in terms of council and staff time. Accordingly, there may be substantial

1 benefits gained from using simulations to design data-based rules (based on survey
2 index, in-season depletion estimates) for setting catch limits instead of relying on
3 assessment models. At a minimum, such simulations might improve understanding
4 the performance of a particular assessment model before bringing it forward to the
5 council process and fitting it to the most recent data. If the Harvest Management
6 Framework requires these models, then it might be impeding good management
7 due to both poor estimates of biomass and reference points, but also by limiting,
8 through the burden imposed by the review process, the number of species that can
9 be assessed, resulting in undetected overfishing/underfishing.

10
11 Several presenters referred to the desire, or need, to use Management Strategy
12 Evaluation (MSE) but their specific definition of MSE and the problems they hope to
13 solve using it are not clear to me. There seemed to be some interest on the part of
14 managers about what MSE is so I have provided some references and some
15 observations about it, as well as its advantages and disadvantages based on my own
16 limited experience below.

17
18 I view MSE as a broad process (Smith 1993, De La Mare 1998, Cox and Kronlund
19 2008) that uses closed-loop computer simulation to iteratively test the performance
20 of a set of management procedures against a set of objectives. Typically, a known
21 state of nature is simulated using an operating model that provides simulated data
22 to an assessment model, whose output get converted into total allowable catch
23 mathematically using a harvest control rule. The combination of data, assessment
24 model and harvest control rule used to determine catch levels is referred to as a
25 management procedure (or management strategy). Typically objectives are also
26 refined during the process as the costs, benefits and tradeoffs (typically between
27 total catch, variability in catch and conservation) are illustrated.

28
29 It is the defining and refining of objectives that makes the MSE process broad
30 because it involves stakeholders and decision makers. Whether a broader
31 consideration of objectives is intended at the outset or not, my experience has been
32 that the closed-loop simulation exercise is very valuable on its own for testing the
33 performance of existing management procedures, and it will inevitably require
34 parties involved in the process to address the question: what is the definition of
35 good management procedure performance?

36
37 My personal experience with MSE to date has been limited to a narrowly focused
38 type (Pacific hake) and a nascent, broad evaluation of the performance of the
39 existing management procedure in the case of Pacific herring fisheries. In the Pacific
40 hake case, the Canada-US Joint Technical Committee used closed-loop simulations to
41 provide advice about narrowly defined questions (in particular, the marginal
42 benefits of annual vs. biennial surveys), to justify decisions about model structure,
43 and to provide qualitative information about the performance of the existing
44 management procedure (JTC 2013, 2014). In the hake process, the use of MSE in the
45 future is a matter that is under continued discussion through a separate sub-
46 committee of the treaty process in an effort to balance MSE activities with

1 assessment demands. I am also involved in a nascent MSE for Pacific herring. In this
2 instance, the MSE *is* intended to broadly redefine the existing management
3 procedure because every element of it (the data, the assessment model, the harvest
4 control rule and the objectives, etc.) is in flux. I would encourage analysts to be very
5 clear in discussion with decisions makers about what issues they are attempting to
6 tackle with MSE/closed-loop optimization, how they will balance these efforts with
7 existing assessment demands, and how the results will be used.

8
9 I think of MSE as a process rather than a product. Even though closed-loop
10 simulation elements may be completed relatively quickly, the process may be
11 prolonged (or repeated) because the understanding of both population dynamics
12 and objectives are also evolving. For example, Pacific herring in Canada can be seen
13 as a cautionary tale. Fisheries and Oceans Canada set a harvest control rule in the
14 mid-1980s that was partly supported by some very forward thinking simulation
15 analyses illustrating tradeoffs between conservation benefits, catch and variability
16 in catch (Hall et al. 1988). One challenge (among many) was that in some areas
17 apparent increases in natural mortality resulted in lower biomass levels and much
18 higher closure frequencies beginning in the early-mid 2000s than the original MSE
19 predicted. In spite of this, the harvest control rule had become entrenched and is
20 only just now undergoing re-examination more than 25 years after it was
21 introduced. Part of the MSE process includes learning from the practical experience
22 of applying a given management procedure when the performance of that
23 procedure departs from analytical predictions; however, there will be no learning if
24 there is resistance to making predictions in the first place or if the management
25 procedure is inconsistently applied in practice through frequent changes to
26 assessment models/data choices.

27
28 While promising, MSE has limitations. The evaluation needs time, capacity, and the
29 involvement of stakeholders (who may or may not want MSE, or formalized control
30 rules, or a change in the status quo). There is also no avoiding some form of the
31 “base case” argument; i.e., in MSE the equivalent of the base case debate is about the
32 choice of the operating model(s). As was highlighted, staff capacity limits ability to
33 do MSE, or even meet the demands of the regular standardized assessments.
34 Butterworth (2007) discusses ways to overcome some of difficulties involved in
35 undertaking MSE. But with respect to increasing assessment throughput, there
36 might be long-term efficiencies gained if the MSE could be used to justify the
37 application of management procedures that are updated at broader time intervals
38 (e.g., every 5 years), thereby reducing year by year haggling over the base case
39 assessment model.

40
41 One thing that makes MSE development expensive and time consuming is building
42 the software. However, some of the practical limitations of conducting MSE may be
43 overcome as the discipline evolves. Additional efficiencies may be gained in
44 developing MSE simulation tools that can be applied more quickly and easily or in
45 using those in the public domain as they become more readily available. There are a
46 few examples of the latter: the Fisheries Library in R was used in the ICES domain,

1 and in Canada, SFU (Sean Cox) is developing tools where the simulation model can
2 be built quickly by exporting fishing mortalities, recruitment anomalies, and key life
3 history parameters from existing stock assessment models. Developing/modifying
4 general software that could be applied easily by many users might greatly reduce
5 some of the limitations to doing MSE identified above.

6 7 8 **Assessment process**

9 **Peer review**

10 *Observations*

11 In the HMS case, I think it is important to note that the peer-review process has
12 benefits that are not exclusively about scrutinizing science. For the international
13 situation, there is probably no avoiding that decisions about the assessment model
14 are the first in a series of negotiation maneuvers or reconciliation between the
15 parties. Since there is very little that can be done about the behavior of the parties,
16 there seems to be very little choice other than to accept the situation as it is and
17 attempt to deal with it as best as possible.

18
19 The peer-review processes for stocks managed under the auspices of the PFMC have
20 very well developed processes. With that said, even if they were lacking, it is not
21 clear to me how much authority, or latitude there is for the SWFSC to modify the
22 process. If the SWFSC has such authority, I have made some suggestions below.

23 24 *Strengths*

25 For HMS, in spite of both the practical difficulties of peer-review in the decision
26 making process, the SWFSC has at least engaged in seeking out reviews of some sort.
27 While these reviews may only carry weight in an advisory capacity, this is at least
28 something to justify the position of the US about the most defensible model
29 configurations, and I think an important element in insuring that science guiding
30 HMS is the best possible, given the practical difficulties. Moreover, these reviews
31 might also help form the basis for ISC Best Practices described in the ISC Operations
32 Manual.

33
34 In the non-HMS cases, there is outstanding transparency. This seems to be produced
35 in part by very clear terms of reference for assessment documents and clear
36 guidelines for how meetings will proceed.

37 38 *Challenges*

39 Some of the strengths outlined for processes operating under PFMC guidelines
40 above are also challenges. The rigor of the process appears to be very burdensome
41 on the analysts engaged in it. Furthermore, it is not clear to me that repeated
42 investigations of alternative model configurations during the review process for
43 each full benchmark assessment offers substantial benefits. Making changes to
44 model configurations during the review process does not, in my view, offer the
45 chance for reflection and thoughtfulness that should be involved in decisions about
46 model configuration, data choice, and weighting. Analysts need time to thoughtfully

1 respond to reviews and determine if the criticisms are even justified. I assume that
2 the main basis for the base-case choice is goodness of fit to the data, which in many
3 cases has been acknowledged to be lacking in quantity and/or quality for data poor
4 and data moderate cases. Of course fatal flaws in assessments need to be fixed
5 immediately, but furious activity re-fitting models to data already acknowledged to
6 be lacking during the review process should not be confused with improved
7 understanding, and it might also lead to both assessment errors and burned out
8 analysts.

9
10 At the same time there seems to be the need for some flexibility in the update
11 process for Groundfish and CPS. In data-poor cases in particular, the assessments
12 may be very volatile as new data updates are included, especially if there is high
13 observation error. In these situations, analysts need flexibility not afforded by the
14 update terms of reference to examine unforeseen problems that might emerge.

15 *Recommendations to Address Issues*

16 For HMS, there seem to be many issues that need to be negotiated between the
17 parties at the ISC. One element hampering effective peer review at ISC processes is
18 how and when to pay for reviewers to attend meetings. Having an agreed-to pool of
19 money to consistently cover the cost of the reviewers might lead to a general
20 improvement in the process, particularly if it would lead to broader agreement
21 (because of the credibility added by the peer-review) about the stock assessment
22 (or at least the key uncertainties of those assessments) that form the basis for
23 management decisions.

24
25
26 For Groundfish and CPS, I would suggest that the best time for analysts to deal with
27 reviewers comments is during the off cycle time. The advantage of this would be
28 that matters could be more thoughtfully considered and/or additional analyses,
29 such as simulation, could be brought to bear. More broadly, choices about
30 assessment models might best be justified using simulation in advance of the review
31 rather than redoing model runs during the review.

32 **Organization and priorities**

33 *Observations*

34 I struggled to make judgments about this particular section. In particular I think that
35 I am too unfamiliar with the Center's broader priorities, such as how budgeting line
36 items are tied to specific outcomes, the relative importance of research to applied
37 sciences, and meeting other legislative mandates (e.g., towards endangered species),
38 to comment on whether the institution is organized in a way to meet its priorities.

39 *Strengths*

40
41 I can say without hesitation that the Center has managed to produce impressive
42 assessment throughput while maintaining a relatively high level of innovation. In
43 the Groundfish section, this has included development of novel methods to deal with
44 meeting the requirement to produce OFL for fish stocks. In the CPS and HMS
45 sections, the analysts have also been able to maintain some level of primary
46

1 publication, which is an important element to keep pursuing to keep the center's
2 scientific approaches up to date and improving. Given the apparently high workload
3 of the analysts, this achievement is impressive.

4 *Challenges*

6 As I have commented in other sections, it appears that workload is at or near the
7 limit of the analysts involved in Groundfish, CPS and HMS groups. Some institutional
8 requirements, such as documentation burdens for assessments under PFMC, the
9 sheer amount of travel for HMS, and PFMC support, exacerbate these demands.

11 *Recommendations to address issues*

12 MSE-2015 as a prioritization exercise is a great idea, especially if the evaluation
13 could capture some of the tradeoff effects of depth vs. breadth in assessment
14 activities. Since the demand for the number of species to be assessed appears to be
15 large, it will be important to determine in which situations doing very complex
16 assessments for some stocks impedes the Center's ability to assess more stocks.

18 In addition, there is some need to do some relatively unglamorous science to
19 advance progress of the assessment program. Notably, getting old ageing structures
20 aged for assessment purposes is key because virtually every assessment, and the
21 data-poor ones in particular, rely on some estimate of natural mortality; one
22 common way of estimating mortality is to use the oldest age fish observed in the
23 population (Hoenig 1983, Hewitt and Hoenig 2005). Improvements in database
24 support would improve efficiency as well.

27 **Accomplishments relative to mandates**

29 *Strengths*

30 The Center appears to be meeting its mandate to assess core species given the data
31 it has available and has made good use of emerging stock assessment tools to deal
32 with data-poor situations. There has also been an attempt to include new data
33 sources (e.g., rockfish recruitment surveys) and research on changes in
34 reproductive output as environmental conditions changes. In the Groundfish case,
35 this appears to have resulted in increased FSSI scores with most stocks above target
36 levels.

39 *Challenges*

40 The lag between the assessment cycle and the implementation of assessment results
41 is problematic. One presenter noted that 2012 data are effectively used to inform
42 2014-15 management. Management would benefit greatly by overcoming the
43 hurdles that are preventing use of the most recent data, particularly for stocks
44 where the dynamics are fast.

1 It seems that the Center is meeting its analytical demands relative to its mandates
2 but it was telling that, during the presentations, it was mentioned that the analysts
3 are one flu season away from disaster. CPS, Groundfish and HMS groups do seem to
4 need some modifications to align capacity with production. I think each assessment
5 group would benefit by the addition of at least one analyst because a flu season will
6 inevitably arrive.

7
8 There was a statement that there had been modest successes for Groundfish in
9 formally incorporating ecosystem impacts into assessments. I am sympathetic to
10 assessment authors for not understanding, or for not quantitatively including such
11 ecosystem considerations into their assessments. For example, the apparent
12 relationship between log R/S and PDO was discussed for some cases; however, even
13 if the correlation can be trusted, the missing key element is that the PDO is unknown
14 for next year, and the year after that. I discuss some suggestions for how ecosystem
15 considerations could be formally considered using modeling below.

16 17 *Recommendations to address issues*

18 I have made some recommendations to address the challenges in other sections. In
19 brief, my recommendations are (1) to streamline the assessment process by using
20 simulations to justify a management procedure (perhaps based on the data alone)
21 that could be applied consistently instead of regular haggling over the base case, (2)
22 to get some database management support so that assessment authors are not also
23 burdened with this task and (3) to use the assessment process(es) to guide research
24 initiatives into resolving key uncertainties that need to be resolved to improve
25 assessments.

26 27 28 **Communication of assessment results and data needs**

29 *Observations*

30 Much of the communication of assessment results occur through relatively
31 conventional means.

32 33 *Recommendations to Address Issues*

34 I think that communication in general could benefit from more diverse
35 communication instruments than documents and webpages. I think a series of
36 workshops that could be presented to key stakeholders (or for that matter
37 congressional staffers, etc.) would benefit communication greatly. A couple of key
38 areas to focus on might be Fisheries Stock Assessment 101 and MSE for managers.
39 For British Columbia herring managers, we ran an MSE workshop in conjunction
40 with Simon Fraser University to help both explain to them what the tool was and
41 also to illustrate to them how it could be used to help structure a process for
42 deciding on objectives and operational control rules. The workshop was educational
43 for the scientists involved, who benefitted from a better understanding of the
44 political situation and behavior of the fisheries on the grounds, and was also a much
45 safer place for having discussions about how science could be used to improve
46 fisheries management than during the quota setting process.

1 **Other: Incorporating Ecosystem and Environment Into Assessments**

2
3 *Observations*

4 It seems that many of the research activities described under this section were
5 those that have long been underway at the SWFSC.

6
7 *Challenges*

8 It not clear to me that the environmental observation programs are actually
9 designed to answer research priorities that have been identified by assessment
10 processes, or to meet the SWFSC's mandates for fisheries management and
11 endangered species, or if they are being pursued because of historical practice. I am
12 suspicious of virtually all work on ecosystem indicators. In many cases, such
13 indicators sound like quantities that should be useful to guide predictions but in
14 practice have been derived from mostly correlative studies whose predictive value
15 has broken down over time and for which there is no established relationship
16 between the indicator and the process it intends to represent.

17
18 While the system's productivity is undoubtedly an important factor in affecting
19 population sizes of fish (and higher trophic levels), the role of top down processes is
20 key as well. Trophic factors can affect recruitment (Walters and Korman 1999) and
21 natural mortality. The latter will affect virtually every element of a fisheries stock
22 assessment including the reference points, current stock status, and future stock
23 status. Rather than ecosystem indicators, what would help greatly for fish
24 population assessments are measures of key fish and marine mammal rates, such as
25 predation, natural mortality, and movement.

26
27 *Recommendations to Address Issues*

28 It seems unlikely that the use of ecosystem models will very quickly assume a
29 prominent place in fisheries management but there are more modest scenarios
30 where their outputs could be applied soon. Closed-loop simulations could be used to
31 test the performance of the harvest control rule currently being applied using single
32 species assessments when some ecosystem-driven parameters (e.g., growth,
33 recruitment, natural mortality) are in flux. Such analyses should help illustrate how
34 robust the management system would be to those changes anticipated by ecosystem
35 models. Smaller predator-prey models (two species, or three species, see
36 <http://www.afsc.noaa.gov/Quarterly/amj2012/divrptsREFM2.htm>) could also be
37 tested. In addition to being more practical to produce, these smaller projects would
38 be an excellent introduction to what fisheries management may have to deal with as
39 fisheries evolve in response to ecosystem changes.

40
41
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1 **Panel Member B**

2
3 **2014 NMFS Science Program Review**

4
5 **Reviewer Report on Program Review of Stock Assessment Process**

6
7 **Southwest Fisheries Science Center**

8 **8901 La Jolla Shores Drive La Jolla, CA 92037-1508**

9 **July 28th – August 1st, 2014**

10
11 **Background**

12 The SWFSC has a long history of providing scientific advice to managers on Highly
13 Migratory Species (HMS), Coastal Pelagic Species (CPS), and groundfish. Center
14 scientists now are active participants in the stock assessment enterprise for HMS,
15 CPS and groundfish and they play an integral part as lead authors on stock
16 assessment documents and reports. The duties and responsibilities associated with
17 these tasks are technically challenging and intellectually demanding.

18
19 **General Observations and Recommendation**

20 The stock assessment group should be commended for the hard work that must
21 have gone into the preparation of the background information for the meeting. The
22 background materials facilitated an effective and efficient use of our time.

23
24 The SWFSC has attracted a well qualified group of dedicated stock assessment
25 scientists. The group is operating at a very lean staffing level and in some programs
26 retirements have added an additional work load onto the already full plates of the
27 stock assessment scientists. A high priority should be placed on succession planning
28 and training of young scientists to guard against unforeseen events that could
29 interrupt the timely delivery of stock assessment advice.

30
31 The SWFSC scientists have earned the respect of their colleagues and their
32 reputations and proven capabilities will help to attract funding to expand the group.
33 Members of the program have developed creative solutions to complex assessment
34 issues and these solutions have been transferred to other NOAA Science Centers.

1 **Key (Specific) Findings and Recommendations**

2
3 **Theme I: High-level scientific/technical approach**

4
5 ***Overview***

6 The SWFSC has a highly trained and productive group of stock assessment
7 scientists. The analysts have aligned their stock assessment approach to provide
8 sound scientific advice to managers. In some cases, the groups have successfully
9 advocated for improvements in fishery independent abundance data.

10
11 ***Strengths***

- 12 • Scientists at the SWFSC are well qualified and experts in their field.
- 13 • Scientists are publishing papers that address cutting-edge issues within the
14 field of stock assessment and resource management. They have introduced
15 novel methods for assessing data moderate and data poor stocks. Scientists
16 have published new approaches to deal with difficult parameter estimation
17 issues as well as model specification to address stock structure.
- 18 • Scientists have worked to reconstruct catch records for groundfish.
- 19 • Scientists responsible for the CPS assessments were effective in working
20 with Center scientists to advocate for the inclusion of sardine in the SAKE
21 survey. This development has improved the credibility of the assessment.
- 22 • The CPS analysts have proposed an egg escapement based method for
23 managing market squid. This approach provides a rationale basis for setting
24 quotas.
- 25 • CPS and HMS analysts in collaboration with other scientists have developed
26 proxies for accounting for stock structure and movement within their
27 models.
- 28 • Co-location of the SWFSC and IATTC allows for collaboration on the
29 development of innovative methods for stock assessment.
- 30 • HMS stock assessments scientists are working with scientists from other
31 nations to improve their familiarity with the use of stock synthesis.

32
33 ***Challenges***

- 34 • Catch statistics for groundfish are collected by a variety of entities along the
35 west coast, in general these are uploaded to a central database (PacFIN)
36 however, there appears to be a time lag in the delivery of recent catch
37 information. Thus, the analysts spend valuable time trying to track down
38 information that should be readily accessible from a central database.

- 1 • Fishery dependent and fishery independent data for CPS and HMS species
2 depend on contributions from other nations. The assessment scientists at
3 SWFSC can't control the timeliness of data delivery from these nations. The
4 analysts spend valuable time collating data series for input into assessments.
- 5 • Although the egg escapement based method for managing market squid
6 provides a rationale basis for setting quotas, additional research will be
7 needed to evaluate what level of escapement is sustainable. Squid represent
8 a key prey resource for several species and some consideration of minimum
9 thresholds for removals of prey should be considered.
- 10 • Adoption of data moderate assessment methods could lead to complacency
11 with respect to monitoring associated biological information regarding stock
12 status (e.g., age composition, length frequency, maturation schedule). These
13 data provide a history of stock status and productivity that may be needed
14 for ecosystem modeling or retrospective fisheries oceanography studies.
- 15 • Center staff identified that there is a need to hire scientists capable of
16 developing, and implementing models to conduct quantitative management
17 strategy evaluations.
- 18 • Inevitably there will be a data poor stock that either becomes subject to a
19 developing fishery or a stock that becomes vulnerable to high exploitation
20 due to shifts in target fishery abundance (increased incidental catch) or
21 declines in abundance. It is not clear how these stocks would be transitioned
22 from data poor to data moderate or data rich classifications.
- 23 • Utilizing the SAKE survey requires a commitment to the collection of the key
24 survey parameters (e.g., target strength) for target species.

25

26 ***Recommendations to address these issues***

- 27 • The SWFSC should work with CALCOM and PacFIN to discuss options for
28 expediting the delivery of data to a centralized database.
- 29 • The SWFSC could consider hiring a data support person for HMS and CPS
30 stocks. This person would be responsible for compiling data for assessment
31 analysts and he/she could conduct retrospective studies to assess data
32 quality and reliability.
- 33 • To the extent possible it would be useful for NMFS to work with contributing
34 Nations to establish a data sharing agreement that includes best practices for
35 data collection, estimation of CPUE or survey biomass, and timelines for
36 delivery of information to assessment analysts.
- 37 • In years when data poor or data moderate assessments are reviewed, the
38 analysts should update and review the Productivity Susceptibility Analysis

1 (PSA) to ensure that conservation concerns are not emerging. This update
2 could be used to identify stocks where additional investment in the
3 development of reliable fishery dependent or fishery independent indices to
4 improve the quality of the assessment.

- 5 • An effort to complete age determinations for historical collections of
6 potentially long lived species could reduce the possibility of misspecification
7 of the natural mortality rate.
- 8 • CPS assessment scientists responsible for squid assessments could work
9 with ecosystem modelers to explore ways to estimate the minimum stock
10 size threshold necessary to sustain predators that depend on squid.
- 11 • Hiring scientists who are experienced in the development and
12 implementation of stock assessment models and management strategy
13 evaluations (MSEs) is clearly an ideal approach to filling vacancies with the
14 SWFSC. In the interim, the current practice of providing post-doctoral
15 research grants to address pressing issues that require a MSE type
16 assessment is a good approach. For analysts working on groundfish issues,
17 there may be opportunities to work in collaboration with scientists at the
18 NWFSC to complete some of the most pressing evaluations. This approach is
19 not a long-term solution for the SWFSC.
- 20 • To fully utilize the SAKE survey for sardine and Pacific mackerel will require
21 careful assessment of target strength, methods to address mixed stock
22 schools. In addition an inter-ship calibration between the Reuben Lasker and
23 the new Mexican research vessel will be necessary.
- 24 • Communication between the survey group responsible for the SAKE survey
25 and the assessment analysts should be encouraged. Scientists might
26 consider establishing a schedule for annual (or twice yearly) planning
27 meetings between the two groups.
- 28 • The groundfish trawl survey group is housed at the NWFSC and some of the
29 essential fish habitat specialists are housed at the SWFSC. These scientists
30 need to be in close communication with the stock assessment scientists to
31 ensure that they have input into proposed research and / or proposed
32 changes to survey design. One or two web-ex meetings a year could be
33 conducted to: 1) review results of the most recent survey, 2) discuss
34 proposed fishery independent research and 3) to identify candidate species
35 that will require elevation from data poor to data moderate status due to
36 increased susceptibility and vulnerability to fishing.

37

1 **Theme II: Assessment process**

3 ***Overview***

4 The PFMC has worked with NMFS to develop a well defined stock assessment
5 process that includes: clear timelines for delivery of assessments, guidelines for the
6 content of assessments, and guidelines for the structure of reviews. The assessment
7 process for HMS species is not as well defined. The ISC has attempted to address
8 this through the development of an operations manual. While the ISC operations
9 manual represents an important first step, additional work is needed to reach
10 agreed upon harvest control rules.

12 ***Strengths***

- 13 • The Benchmark / Full assessments of HMS, CPS and groundfish utilize sound
14 stock assessment methods and provide clear advice for management bodies.
- 15 • The PFMC has clear harvest control rules for groundfish and CPS that allow
16 the Council to determine OFL, ACL and ABC based on the data available. An
17 outline for the preparation of the CPS and groundfish stock assessments is
18 contained within the Groundfish/CPS Star Panel Terms of Reference. This
19 outline includes the necessary description of the data, model description, and
20 diagnostics needed for a thorough review of the assessment.
- 21 • SWFSC analysts understand the methods for estimating biological reference
22 points and harvest control rules (HCRs) for CPS and groundfish. These
23 reference points and HCRs have been agreed upon by the PFMC SSC and
24 adopted in the FMPs. The public understands how these rules will impact
25 quotas. These harvest polices have been effective at rebuilding many of the
26 overfished stocks.
- 27 • The International Scientific Committee (ISC) for tuna and tuna like species
28 operations manual provides guidelines for the preparation of assessment
29 reports.

30 ***Challenges***

- 31 • For high profile, category 1 stock assessments that are on a biennial review
32 schedule, the STAR panel teams may consist of a constantly changing suite of
33 reviewers. This will require time consuming re-iteration of core elements of
34 the assessment.
- 35 • The PFMC process for review and rule making creates a situation where
36 harvest recommendations are based on outdated stock status information.

1 **Solutions**

- 2 • Scientists from the NWFSC and SWFSC should ask the West Coast Regional
3 Office to review options for streamlining the rule making process to ensure
4 that harvest specifications are based on the best available science.
- 5 • If possible it would be desirable for member countries to agree on biological
6 reference points and harvest control rules for HMS. This would reduce the
7 annual uncertainty in proposed harvest specifications. An added benefit
8 would be a clear partitioning of science and policy.

9

10

11 **Theme III: Peer review**

12

13 **Overview**

14 The PFMC, in consultation with the NWFSC and SWFSC, has established a
15 rigorous peer review process that provides a thorough examination of the data and
16 the model structure used to assess CPS and groundfish stocks. The SWFSC scientists
17 solicit CIE reviews of their HMS assessments. These reviews improve the credibility
18 of the assessments to the public. The process for CPS and groundfish should be re-
19 visited to determine whether it is necessary to impose the requirement of selection
20 of the base model during the review.

21

22 **Strengths**

- 23 • The roles of the PFMC assessment reviewers and analysts are clearly defined.
- 24 • STAR panel reviews of CPS and groundfish are open to the public.
- 25 • STAR panels provide a thorough review of assessments.
- 26 • The STAR panels and SSC provide scientific advice to the assessment authors
27 about the assessment.
- 28 • The STAR Panel TORs allows the author the freedom to explore new model
29 configurations and/or inclusion of data according to his or her judgment. The
30 assessment analyst is usually the person who knows the most about the data
31 and the stock and therefore this process allows the assessment scientists to
32 advance new ideas within the peer review process. This leads to innovation
33 and improvement to the models.
- 34 • The PFMC SSC is composed of an interdisciplinary group of scientists from
35 academic and government institutions. This group is capable of providing
36 sound stock assessment review and science recommendations to managers.
- 37 • The ISC operations manual includes a recommendation for periodic reviews
38 of stock assessments and outlines how reviewers would be selected.

- 1 • The SWFSC HMS group requests periodic CIE reviews of their assessments.

2 **Challenges**

- 3 • The PPMC process for peer review imposes undue stress on the analysts that
4 may not provide the time needed to foster careful and thoughtful
5 consideration of proposed changes to the assessment. The process
6 combines a review of data inputs, model structure, and model performance
7 with selection of a preferred model all in one meeting. As noted in the TOR
8 for reviews “*During the review meeting, the STAR panel and the STAT should*
9 *strive to reach a consensus on a single base model.*” In situations where
10 consensus can’t be reached the process calls for a “mop-up” panel. In
11 discussions with analysts it became clear that analysts are asked to make
12 substantial changes to the model configuration and/or data inputs in a very
13 short period of time. It is not clear what benefit is derived by the inclusion of
14 the requirement of deriving consensus on the base model during the review.
15 • It was not clear whether assessments developed by scientists at the SWFSC
16 undergo in-house review prior to release to review bodies.

17

18 **Solutions**

- 19 • Scientists from the NWFSC and SWFSC should meet with the Council staff to
20 review the current stock assessment review process. The Centers and
21 Council might consider the merits of dropping the need for consensus on
22 base model. This would allow the author more time to carefully consider the
23 issues and concerns raised by during the review.
24 • The plan to hold methods workshops on data preparation and assessment
25 methods for HMS is excellent. This will have the benefit of creating a
26 common understanding of the best practices for estimating stock status.
27 Funding should be provided to ensure that key scientists from contributing
28 nations can attend these meetings.
29 • Funds should be provided to allow assessment scientists from other member
30 nations to observe and participate in CIE reviews of HMS species.
31 • The SWFSC might consider developing a rotating schedule for in-house
32 review of assessments before they are released to the public. This would
33 have the dual purpose of educating other stock assessment scientists about
34 the specifics of each stock assessment and it would help to identify errors
35 before the documents are released.

1 **Theme IV: Organization and priorities**

2

3 ***Observations***

4 The NMFS Office of Science and Technology, in consultation with the Science
5 Centers has developed a stock prioritization tool. This tool will assist the PFMC in
6 selecting which assessments should be conducted in any given year. While this tool
7 is based on a reasoned approach, several of the ranking categories are subjective
8 and therefore, the prioritization issues will be region specific. Assessment scientists
9 from NWFSC and SWFSC will have to continue to work with the PFMC to establish a
10 prioritization schedule for assessment reviews. Furthermore this prioritization
11 scheme is new and untested. As data is accumulated on data poor stocks previous
12 assumptions regarding stock status may change. Therefore some flexibility in
13 interpreting prioritization scores will be needed.

14

15 ***Strengths***

- 16
- The NMFS has established a prioritization process that will allow science
17 centers to carefully consider the frequency and level of assessments.
 - The schedule for producing the groundfish assessments and their category
18 (1, 2 or 3) is determined through a dialog between the NWFSC, the SWFSC
19 and the PFMC.
 - Stock assessment priorities are discussed by the Council.
- 20
21
22

23

24

Challenges

- 25
- Although the NMFS has established a prioritization process, it is not clear
26 how funding NMFS will be able to address situations where stocks are
27 elevated in priority but funds for core data collection needed to achieve the
28 appropriate assessment level are not available or unattainable in the short
29 term.
 - The workload for HMS stock assessments is very high and results in a heavy
30 burden for these scientists.
 - Recent retirements of key scientists within the groundfish assessment group
31 creates void in the program and increased work load on remaining staff.
- 32
33

34

35 ***Solutions***

- 36
- Separating the duties of data preparation and compilation from stock
37 assessment could alleviate some of the travel burden and work load on HMS
38 assessment scientists.

- 1 • The methodology and data inputs used to assess some of the groundfish and
2 CPS stocks scientists should stabilize over time. Once the methods have been
3 thoroughly peer reviewed, full assessments could be conducted on a more
4 timely basis to utilize the best available data. At this time, the Science
5 Centers and the PFMC may wish to re-visit their schedule for STAR.
- 6 • NMFS might consider providing contract funds to recently retired
7 assessment scientists to fill the gap in assessment expertise and to mitigate
8 the workload until qualified replacement scientists can be hired and trained.

9

10 **Theme V: Accomplishments relative to mandates**

11 ***Observations***

12 Stock assessment scientists are doing a good job of fulfilling the federal
13 mandates associated with their assigned stocks. The responsibilities of State and
14 Federal agencies in supporting stock assessments should be agreed upon to assist in
15 long-range planning and investment in assessment related science.

16 ***Strengths***

- 17 • Scientists at the SWFSC are responsible for assessing approximately one
18 third of the west coast groundfish assessments. These assessments have
19 been completed and delivered to the PFMC as required based on the review
20 schedule for any given year.
- 21 • There has been a decline in the participation of State Biologists in the
22 development of some groundfish and CPS stock assessments and the SWFSC
23 stock assessment scientists have been interested in assuming lead
24 responsibility for these assessments. So far, the SWFSC has been able to
25 absorb this added responsibility.
- 26 • The SWFSC is co-located with one of the premier oceanographic institutions
27 in the world. Scientists from NMFS and SIO have a long and successful
28 history of working together on fisheries oceanographic issues.
- 29 • Center leadership is well positioned to continue to foster integrated research
30 partnerships with SIO. The SWFSC and NWFSC received IEA funds that have
31 already facilitated this type of integrative research approach.
- 32 • Coupled bio-physical models of the CCS and Pacific Ocean track bottom-up
33 processes influencing the distribution and abundance of zooplankton (a key
34 prey resource). Assessment scientists are currently utilizing information
35 from coupled models to defining pelagic fish habitats for some CPS and HMS.

- 1 • Maintaining time series of numerous ecosystem features makes it possible to
2 detect decadal-scale regime shifts as well as long-term effects of global
3 warming.
- 4 • The HCR for sardine acknowledges climate role in productivity and thus
5 provides a basis for separating natural stock decline from stock collapse due
6 to fishing.

7

8 ***Challenges***

- 9 • Reductions in staff levels due to recent retirements may limit the ability of
10 the SWFSC to continue to absorb stock assessment duties previously held by
11 State biologists.
- 12 • If the work required by SWFSC scientists to fulfill the mandates for
13 assessments of federally managed stocks increases, an agreement between
14 the State and Federal agencies may be needed to address how or whether
15 SWFSC scientists should continue to lead assessments for State managed
16 stocks.
- 17 • Research on mechanisms linking environmental forcing and key processes
18 modeled within the assessment often end with the completion of a
19 retrospective statistical analysis. This is useful in deriving the functional
20 form and parameterization of this relationship. Assessment scientists could
21 utilize this information to parameterize stock projection models. Therefore,
22 estimates of uncertainty surrounding the predictive skill of the relationship
23 would be useful.
- 24 • While ecosystem indicators have been developed and are reported on in the
25 CalCOFI state of the California Current report, there is not a clear link
26 between these indicators and PFMC or ISC harvest policies.

27

28 ***Solutions***

- 29 • Leaders from the SWFSC and the CDF&G could meet to discuss current and
30 future expectations for meeting the stock assessment requirements for their
31 two agencies.
- 32 • Require that fisheries oceanographers that publish on environmental forcing
33 on growth, recruitment, or spatial distribution, follow through with
34 predictions for the upcoming year. These should be included in the CalCOFI
35 state of the California Current report.
- 36 • Research on ecosystem indicators should include an attempt to identify
37 thresholds for defining the risk to marine resources. Once defined, analysts

1 should meet to consider when or if the risk of environmental change should
2 be incorporated into existing uncertainty buffers.

3

4 **Theme VI: Communication**

5 ***Observations***

6 Stock assessment scientists are doing a good job of communicating their
7 results to the public through the PFMC process. My perception was that internal
8 communication between stock assessment scientists was somewhat stove piped
9 along species lines. This could be alleviated through the formation of a core stock
10 assessment workgroup within the Center or improved communication through
11 regularly scheduled workshops or meetings. Scientists within the SWFSC are co-
12 located with the IATTC and there appears to be a good exchange of information and
13 analytical approaches between the two groups.

14 ***Strengths***

- 15 • A link to the PFMC website for the groundfish and CPS assessments is
16 available.
- 17 • Stock assessment reviews are open to the public and stakeholders often
18 attend STAR panel reviews.
- 19 • Scientists within the SWFSC participate in the Center for Stock Assessment
20 Research (CSTAR) and the Center for the Advancement of Population
21 Assessment Methodology (CAPAM). This provides a mechanism for
22 mentoring students and for workshops to advance stock assessment
23 methods.

24 ***Challenge***

- 25 • Assessment staff work in different locations yet their research and modeling
26 approaches are transferable. Thus some forum for communication may be
27 needed.

28 ***Solutions***

- 29 • Establish a communication forum for information exchange through web-ex.
30 This forum would include scientists from the SWFSC, IATTC, CSTAR, CAPAM
31 and other graduate students involved in quantitative assessment related
32 projects to share innovations and analytical approaches.
- 33 • As noted above, HMS stock assessments scientists are working with
34 scientists from other nations to improve their familiarity with the use of

- 1 stock synthesis. Providing forums for discussion of modeling issues could
2 enhance this training.
- 3 • A link to the PFMC website for the groundfish and CPS assessments should be
4 available from the SWFSC site. A similar link should be available for HMS
5 assessments.

6

7 **Theme VII: Opportunities**

8

9 ***Observations***

10 The University of California and Stanford houses some of the world's leaders
11 in fisheries oceanography, climate change research, and population dynamics. The
12 SWFSC has a great opportunity to encourage these professors to develop a course of
13 study that would train students interested in stock assessment, applied science and
14 management strategy evaluation. The stock assessment scientists at the SWFSC
15 have already started to facilitate this process through the formation of the CSTAR
16 and CAPAM programs.

17

18 ***Strengths***

- 19 • When looking at the suite of professors that are working at Universities
20 within the State of California, it is clear that the list includes some of the
21 world's leaders in fisheries science.
- 22 • The SWFSC has initiated partnerships with universities to leverage its
23 university partners through the CSTAR and CAPAM programs.
- 24 • The SWFSC is currently housing NMFS staff at Universities.

25

26 ***Challenge***

- 27 • A key challenge is that the faculty with expertise needed to adequately train
28 students in quantitative stock assessment and resource management are
29 spread throughout the state. While the CSTAR and CAPAM programs are a
30 great start, there is no core group of professors who provide an integrated
31 stock assessment teaching program.
- 32 • There is no core group of students being trained in stock assessment and
33 resource management. Thus, the pool of qualified students available to the
34 SWFSC for hire is limited.

35

36

37

38

1 ***Solutions***

- 2
- 3 • There is an opportunity to work with UC system to develop a quantitative
4 fisheries management core course. While the UC system employs teachers
5 involved in quantitative resource management, these professors are not
6 located at the same institution. Center leadership could engage a high level
7 discussion with the University of California to propose the formation of a
8 joint teaching program for students interested in quantitative ecology and
9 resource management for fisheries. This course series could be taught
10 through distance learning where possible with perhaps short 1-2 week
11 intense periods of rotational study at the home institution of the lead faculty.
12 The technology has advanced to facilitate this type of distance learning
13 opportunity and this would fill a clear need for the fish assessment programs
14 at the SWFSC.
- 15

1 **Panel Member C**

2
3 **2014 NMFS Science Program Review**

4
5 **Reviewer Report on Program Review of Stock Assessment Process**

6
7 **Science Center - SWFSC**

8 **Address - La Jolla**

9 **Dates - July 28 - Aug. 1, 2014**

10
11 **General Observations and Recommendation**

12 The Center's management and staff hosted a well-organized, professional and
13 thorough review. Staff was forthcoming in providing their insights and concerns and
14 were readily available and accommodating to the Panel. The presentations of
15 materials and background information were comprehensive, informative and at
16 times overwhelming. It was a pleasurable learning experience to participate in this
17 review process.

18
19 The SWFSC is world renowned as the site of the California Co-operative
20 Oceanographic Fisheries Investigation (CalCOFI) and has a legacy of pioneering
21 scientific research into the biology of sardine and anchovy. The Pacific sardine
22 supported the world's most lucrative fishery for decades and its demise decimated
23 the fishing industry and spawned the first attempts at ecosystem understanding and
24 management. Research focused on trying to understand the population dynamics of
25 sardine as well as what factors in the environment had changed to make it so
26 inhospitable for the species. The outcome of this program has been increased
27 understanding of the biology of much of the forage fish complex in the California
28 Bight as well as the early attempts at developing harvest control rules as evidenced
29 by a legacy of pioneering scientific literature. My review is provided in this context.

30
31 The Center and NMFS as a whole are commended for attempting to address the
32 assessment task in a strategic, and planned manner. Standardizing the modeling
33 tools for data rich assessments and less rigorous approaches for data poor
34 situations, prioritizing the species to be assessed, and subjecting the results and
35 advice to formalized rigorous review provides a framework for developing advice
36 that should be emulated by other agencies.

37
38 To some extent it was difficult to conduct this review without a higher level
39 perspective on the organization as a whole. In other words, how does assessment fit
40 within the context of ESA listed species, routine oceanographic data collection and

1 research, ecosystem related research, etc. Without a clearer understanding of the
2 prioritization of these other activities it is difficult to assess whether the resources
3 currently dedicated to stock assessment are adequate or appropriate.

4
5 Organizations evolve as priorities change and while there has been a loss of staff
6 through retirements and other unfilled assessment positions, core assessments are
7 being completed although with an unclear personal impact on staff some of whom
8 are being overcommitted to an unrealistic assessment schedule. Serious attempts
9 should be made to fill any vacant positions in the assessment groups and where
10 possible add at least one analyst to each of Groundfish, CPS, and HMS. Additionally,
11 key assessments should have a minimum of two existing assessment scientists
12 assigned to them to minimize the possibility of critical errors in the modeling and
13 analysis and assessment advice, provide redundancy in corporate memory around
14 assessment data, modeling decisions, and history, results of reviews, etc. and as a
15 backup against illness or accident.

16
17 A number of analysts expressed concern regarding the lack of time available for
18 assessment related research. The dilemma for the assessment scientist is that
19 promotion is based largely on publication record yet assessment reports are not
20 heavily weighted but require a significant investment of time leaving limited
21 opportunity to conduct the type of research that would lead to primary publications.
22 To that end, it was unclear how managers were directing staff to allocate their time
23 and how much support was provided to individual assessment scientists to assist
24 with technical tasks such as data compilation, report preparation, conducting model
25 runs, etc., which would free their time to dedicate towards other research. A review
26 of how this is dealt with across Centers to make it equitable across assessment
27 practitioners should be considered and perhaps some re-consideration of how
28 assessments are valued in the promotion process would lessen the angst of many
29 stock assessment scientists when it comes to prioritizing their work schedule.

30
31 The jurisdictional divide between Federal and State agencies was unclear. Market
32 squid appear to be a State responsibility yet SWFSC is developing harvest
33 guidelines. Given that this is among the most lucrative fisheries in the area it is
34 surprising that so little effort has been directed to its study or assessment. The roles
35 and responsibility of the Center in squid assessment should be addressed with the
36 State and if necessary resources directed to better understanding its productivity
37 and population dynamics.

38
39 Along similar lines, the northern anchovy has in the past competed with sardine as
40 the most important fishery managed by the SWFSC. Preliminary indications are that

1 as we move into a negative PDO regime sardine abundance will continue to decline
2 and the likelihood of an anchovy or mackerel explosion with unclear impacts on the
3 larger ecosystem will occur. Assessments for both species are long overdue and
4 there appears to be little directed effort to understand their dynamics. The Center is
5 encouraged to initiate an assessment program to better understand anchovy and
6 mackerel population dynamics.

7
8 The importance of environmental variation and ecosystem interactions were noted
9 numerous times as important drivers of population dynamics yet there is limited
10 directed effort into understanding these effects and then developing a process for
11 incorporating the results into the assessment. While there are clearly many
12 exceptions to this, my overall impression was that the assessment groups operate
13 somewhat in isolation from the environmental ecosystem division and that closer
14 integration of these functions should be encouraged.

15
16 It was noted that data are limited for many assessments yet there is a huge backlog
17 of ageing structures that have not been processed. It appears that the ageing
18 function is dispersed. The State does CPS ageing and some HMS while much of the
19 Groundfish ageing is being conducted by at NWFSC or Santa Cruz by contractors
20 although perhaps co-ordinated by Center staff. Such a process is fraught with a
21 number of difficulties including issues of prioritization, standardization of
22 approaches, continuity in application of protocols, validation, etc. The Center and
23 Agency should consider establishing a dedicated ageing laboratory, perhaps at
24 SWFSC, that would oversee prioritization of species, maintaining a database of
25 confirmed ages, and conducting research into new ageing technologies for existing
26 and new species (e.g. HMS) where no methods currently exist. It is also the case that
27 determination of age composition for many of the unassessed Groundfish would
28 benefit from having even a small sample aged which would provide and estimate of
29 natural mortality estimate and further inform the data-poor assessment for the
30 species.

31 32 **Key (Specific) Findings and Recommendations (as reviewer has comments on)**

33 34 **High-level scientific/technical approach**

35
36 The Center is near the forefront of current stock assessment modeling in terms of
37 development and application of state of the art tools. The use of SS for CPS,
38 Groundfish, and HMS where the more complete data series are available is
39 appropriate. Utilization of other tools such as variations of stock reduction analysis
40 for data poor and data moderate species is also encouraged. Staff have shown

1 foresight and initiative in developing and applying the suite of techniques to a wide
2 array of species to provide required advice on harvest and rebuilding targets.

3 4 Strengths

- 5 • Pacific sardine assessment is data rich and continues to improve through
6 development and refinement of abundance indices and research to address
7 key issues such as stock structure.
- 8 • Groundfish staff have contributed to the development of new assessment
9 tools for data-limited species (e.g., DCAC, DB-SRA, XDB-SRA)
- 10 • Staff are active in ancillary research supporting assessments (e.g. rockfish
11 recruitment index, abundance trends for nearshore species from visual
12 surveys, historical catch reconstruction, recruitment-environment linkages
13 for CPS)
- 14 • HMS staff bring technical expertise to international fora and lead many of
15 these assessments and are developing capacity in other jurisdictions through
16 training courses.

17 18 Challenges

- 19 • Insufficient staff in CPS, Groundfish, and HMS to meet the assessment
20 requirements. Programs depend on contractors for many mission critical
21 skills, e.g., ageing, data management, GIS.
- 22 • Acoustic-trawl survey has been adopted as the key abundance index for
23 Pacific sardine but is potentially biased by the inability to access areas of
24 Mexico or Canada to ensure coverage of the entire species distribution.
25 Access to Mexico and Canada are required to survey (collaboratively or
26 independently) trans-boundary ranges of CPS.
- 27 • Sample data and time series necessary for benchmark assessments are
28 incomplete or unavailable for some monitored CPS stocks.
- 29 • Identification and incorporation of environmental data into the recruitment
30 estimation for Pacific sardine.
- 31 • Market squid monitoring and assessment for advising management on
32 sustainable fishing practices.
- 33 • HMS assessments suffer from limited quality data and complex environment
34 with limited understanding of the species biology. In most instances there is
35 no access to the majority of the data.
- 36 • Time demands for assessment, RFMO/Council committees, etc. limit the
37 ability to improve future assessments and to conduct simulation, MSE
38 analysis is needed.

1 Recommendations to address issue

- 2 • For Pacific sardine continue to lobby Mexico concerning need for
3 collaborative survey efforts through the Trinational Forum and other
4 scientific fora.
- 5 • Continue to support long-term investment in acoustic survey operations (bi-
6 annual, cooperative w/ NWFSC hake survey) and collaborations with Mexico
7 and Canada.
- 8 • Initiate development of data-poor assessments for P. mackerel, N. anchovy,
9 Jack mackerel (avg. catch, DCAC, DB-SRA, a4a initiative).
- 10 • Clarify responsibilities with the State around Market squid and provide
11 resources as required.
- 12 • For Groundfish continue to develop novel assessment methods for data-
13 limited stocks and exploration of methods for sampling and estimating the
14 distribution and abundance of nearshore stocks.
- 15 • For HMS continue to help improve assessment capabilities of other member
16 countries in international working groups. Reduce the number of face to face
17 meetings perhaps through web technology.
- 18 • Encourage data sharing for HMS at a finer level of detail to allow for
19 development of more complex assessment models.

20
21 **Assessment process**

22
23 The Center has done an excellent job of conducting routine assessments for the most
24 important CPS, Groundfish, and HMS stocks. The situation for many of the secondary
25 data-poor or data-moderate stocks has not been as good with assessments lagging
26 several years in some instances although the development of new techniques for
27 assessing these groups will provide the basis for more regular and frequent
28 assessments of the majority of the stocks for which the Center is responsible. The
29 TOR for the assessments and associate reports are very prescriptive and have
30 generally been adhered to in delivering the information to the PFMC for review. It is
31 unclear how much of the analyst's time is required to conduct the preliminary data
32 retrieval and preparation prior to the analysis but it does not appear to be a
33 significant burden although the situation varies considerably among species. HMS
34 can be problematic given the difficulties in accessing the data from some nations in a
35 reasonable time frame. Protocols for dealing with technical issues varies among
36 groups with the most standardization in the Groundfish sector and least in HMS
37 where there is a range of technical capability in the WG. Similarly, the HMS has
38 limited protocols for conducting sensitivity analysis and risk evaluation relative to
39 the other two groups.

1 Strengths

- 2 • SWFSC has a long history of assessment research and a core group of
3 analysts with a strong quantitative background as well as resources at the
4 IATTC, SIO, and universities.
- 5 • The standardized primary assessment tool (Stock Synthesis) is well-tested
6 and has a large user and support group.
- 7 • High profile species are assessed as well as possible given the available data.
- 8 • Increasing number of assessment methods (data rich, data moderate, data
9 poor) available to provide advice for stocks with different levels of data
10 quality; more so for Groundfish than for CPS and HMS.
- 11 • Good rapport between WCR fishery managers and SWFSC scientists; good
12 working relationship among scientists working on HMS committees.
- 13 • Informal exchange of data between scientists has been good.
- 14 • Strong relationships with the fishing industry, partners.

15
16
17 Challenges

- 18 • Continued SWFSC role in domestic and international stock assessments due
19 to competing demands for analysts to conduct the analyses for assessments
20 and to participate in review processes. STAR panels and WG meetings can be
21 a highly compressed process, in some cases allowing little time for reflection
22 and forensics on analysis before a final model is adopted. Leaves little time
23 for assessment staff to conduct critical research needed to support the
24 assessment model.
- 25 • Data access and compilation. For CPS there is no single point-source for
26 fishery data. Lack of support for database management and preliminary data
27 preparation. Problems in accessing Mexican data on CPS in a timely manner
28 for assessment analysis.
- 29 • For HMS there is a lack of access to raw data from other countries.
- 30 • Large number of Groundfish species, many with little fishery independent
31 data, and a small number of assessment scientists and capacity to cover all
32 stocks.
- 33 • Goal of getting all the 230 most valuable (economically) stocks that comprise
34 the Fish Stock Sustainability Index assessed.
- 35 • Lack staffing/expertise to develop management strategy evaluations for CPS
36 & HMS;
- 37 • Continuation of state run port sampling programs, especially for monitored
38 species with minimal landings such as anchovy.

39

1 Recommendations to address issue

- 2 • Work with Council staff and SSC to streamline and facilitate more updates
3 rather than full benchmark assessments. Reduce reporting requirements for
4 assessment updates.
- 5 • Continue discussion of CPS stock assessment priorities with international
6 partners. Continue formal process with Mexico e.g., MexUS-Pacifico to
7 improve data access and collaborative modeling.
- 8 • Continue improvements in data management, data access and data analysis
9 to support assessments;
- 10 • Recruit new staff to fill existing vacancies, encourage more engagement and
11 involvement by states and other partners.
- 12 • Management strategy evaluation is often perceived as a panacea but in
13 practice is extremely difficult and time consuming. Consideration should be
14 given to seeking a university collaborator to conduct a MSE on one or two
15 species as prototypes and if successful to assess how widely it might be
16 adopted.

17
18 **Peer review**

19
20 Overall, the peer review process for assessment appears to be thorough and robust
21 with good co-ordination between Center and SSC staff for assessment scheduling.
22 Some concerns were expressed about unnecessary additional model runs requested
23 during meetings that didn't further inform the advice. Occasionally there was
24 redundancy in analyses requested in previous reviews. The pool of competent
25 assessment analysts is limited resulting in a workload issue for Center staff many of
26 whom participate in multiple review panels. The volume of reviews requested often
27 exceeded Center capacity and some rationalization is required by reducing the
28 number of full reviews and more updates or changing the reporting requirements.

29
30 **Strengths**

- 31 • Generally, thorough, independent, transparent reviews are conducted
32 meeting the requirements of the MSA and providing the information
33 necessary for decision making.
- 34 • PFMC peer review process is prescriptive and clearly documented facilitating
35 the development of standardized assessment documents that are easily
36 scrutinized.

1 Challenges

- 2 • Limited number of slots to review benchmark assessments in STAR panels
3 limiting the number of adequate assessments that can be reviewed each year.
- 4 • The collaborative and iterative international WG process leads to a technical
5 review of sorts but is non-independent and often hampered by political
6 considerations.
- 7 • HMS stocks are mostly international so difficult to apply same TOR as
8 domestically. Funding for technical reviews are limited and often preclude
9 face to face reviews resulting in CIE desktop reviews with mixed results.
- 10 • Reviews for management suitability are performed by mostly same
11 assessment scientists or non-technical bodies.

12 Recommendations to address issue

- 14 • Consider the use of more updates for renewing benchmarks periodically.
15 Similarly, data-moderate assessments require less review time and more
16 could be slotted into the STAR process.
- 17 • Invite outside assessment experts into international WG stock assessment
18 process.
- 19 • Support training for international scientists in statistical stock assessment
20 methods to standardize process and increase the pool of potential reviewers.
- 21 • Work more closely at the scientific level to attempt to better separate science
22 from policy in the assessment process.

23 **24 Organization and priorities**

25
26 Assessing the organizational structure was difficult without a clearer understanding
27 of the disposition and roles of support staff involved in the assessment process,
28 survey programs, and other data collection, processing, and management activities.
29 At first glance, the placement of all Groundfish staff in the division centered at the
30 Santa Cruz site and the CPS and HMS staff at the SWFSC center appears appropriate.
31 However, it was unclear how the assessment divisions need to interact with the
32 Marine Mammal and the Oceanographic and Environmental Ecosystem Division
33 staff. To be effective the assessment groups (Groundfish, CPS, HMS) need to have a
34 core or critical mass that allows for cross-fertilization of ideas and mutual support
35 of analytical technique development. Given the evident access to university, IATTC,
36 and other stakeholder staff this does not appear to be a problem at this time.
37 However, should there be increased requirements for assessment related activities
38 in any of the major assessment groups this could become problematic and impact
39 the Center's effectiveness.

1 The approach to prioritization of assessment activities has been largely ad hoc
2 focused on the economically most valuable or ESA listed species. Overall, this
3 approach has been quite effective and although a number of species have not been
4 assessed for a number of years there haven't been any negative consequences from
5 a risk assessment perspective perhaps with the exception of some overfished
6 groundfish species that are in a rebuilding phase. The prioritization process that has
7 been put into place nationally and through discussion with PFMC to address the
8 perceived shortcomings in the assessment frequency over the past decade appear to
9 be well thought out and appropriate to address the short to medium term needs
10 given the available data and resources. The Center is focusing considerable effort on
11 introducing environmental data into individual assessments but the linkage to
12 ecosystem components remains weak.

13

14 Strengths

- 15 • History of robust assessments using reliable tools, more recently
16 encompassing emerging tools to better match methods to data availability
17 for data poor and data moderate stocks.
- 18 • Prioritization of assessments has been done in close collaboration with
19 WCPMC, ISC, PFMC and NWFSC, process is iterative and transparent,
- 20 • Balance among assessment workload and other important efforts (survey,
21 methods development, research) is not ideal, but is generally workable.
- 22 • Long history of robust assessments using reliable tools, including research
23 on ecosystem function (CalCOFI).
- 24 • Strong working relationships with stakeholders and industry (e.g.,
25 Trinational Sardine Forum)

26

27 Challenges

- 28 • Prioritization process is somewhat ad-hoc, not always full agreement among
29 participants, greater predictability would facilitate priority setting of
30 research, aging, other efforts.
- 31 • Workload is greater than resources, an increase in benchmark assessments
32 not feasible without new resources, to do all species.
- 33 • Time lags between data availability, development of assessments, and
34 implementation of management advice are unacceptably long in Groundfish
35 and many of the HMS assessments.
- 36 • Increase in requests for MSEs and ecosystem models that require additional
37 expertise.

38

39

40

1 Recommendations to address issue

- 2 • Continue development of a more rigorous prioritization process and
3 identification of target assessment frequencies and types to balance needs
4 with capacity.
- 5 • Better utilization of updates (ideally with reduced reporting requirements)
6 to increase timeliness and throughput.
- 7 • Continue to recruit additional staff into vacancies with expertise in data
8 analysis, modeling, management strategy evaluation.
- 9 • Support opportunities to free up resources for methods development and
10 other research that would facilitate assessments and foster career
11 development.
- 12 • Continue to support initiatives that incorporate environmental indices into
13 assessment modeling.

14
15 **Accomplishments relative to mandates**

16
17 The SWFSC has made significant inroads into completing the suite of assessments
18 under its mandate but many of the 90+ groundfish species remain unassessed or are
19 overdue for updates. Plans are in place to re-assess them all over the next few years.
20 Nevertheless, the SWFSC has made other significant contributions to the science of
21 fisheries assessment and management through its advice to fisheries management
22 agencies both domestically and internationally, presentation of the results of
23 research studies at conferences and other scientific and public meetings, as well as
24 their dissemination in scientific publications. Substantial attempts have been made
25 to incorporate environmental indices into stock assessments especially for CPS and
26 these could be enhanced through stronger interaction and cross-fertilization with
27 the other divisions, particularly Marine Mammals, Oceanography, and
28 Environmental Ecosystems.

29
30 **Strengths**

- 31 • Robust assessments for all core species using reliable tools and undergoing
32 rigorous review process
- 33 • Emergent suite of data-poor and data-moderate methods allow us to better
34 match methods to data availability and level of need. All targeted Groundfish
35 stocks have a basis for ACL.
- 36 • Current staff adequate to maintain status quo level of assessment quantity &
37 quality
- 38 • The PFMC Pacific Coast Fishery Ecosystem Plan calls for an annual State of
39 the ecosystem report as a PFMC reference input linking to individual species
40 assessments.

- 1 • CalCOFI and other monitoring programs continue and most data are
2 available online.
- 3 • FATE program providing ecosystem analyses and index development.
- 4 • Modeling studies are linking biophysical parameters (e.g. ROMS with
5 NEMURO or EwE) that can included in analyses of individual species.

6 7 Challenges

- 8 • Due to biennial cycle and management measures review, assessments begin
9 to become stale before results are implemented (e.g., 2012 data informs
10 2015-2016 management). Analysts want and need more time for research
11 and method development that might help to shorten the cycle.
- 12 • PFMCC has interpreted the MSA (optimal yield while protecting species) as
13 essentially requiring an ecosystem-based approach. Ecosystem effects are
14 known to be very important to many stocks, but difficult to quantify and
15 incorporate into assessments.
- 16 • Workload is almost always greater than resources. Additional data and
17 survey support needed to do an effective job for Groundfish species in
18 nearshore or untrawlable habitat.
- 19 • ISC's taxonomic WGs adding more species and attendant expectations.
- 20 • No BRPs or HCRs for HMS; true for some CPS as well. All will require
21 additional resources.

22 23 Recommendations to address issue

- 24 • Better utilization of updates to increase timeliness and throughput.
25 Investigate other means to expedite data availability and assessment
26 implementation. Reduce reporting requirements for update assessments.
- 27 • Review assessment schedules to accommodate additional and unassessed
28 species.
- 29 • Continue to pursue research into ecosystem effects, vital for improving long-
30 term understanding of drivers of productivity. Encourage interactions with
31 other areas of NOAA to draw on environmental or ecosystem expertise.
- 32 • Foster International collaboration (ISC, PICES, ICES) on ecosystem
33 understanding and climate variability effects on all species.

34 35 **Communication of assessment results and data needs**

36
37 Communication of scientific information to the world at large requires a multi-
38 pronged approach ranging from detailed scientific reports to very high-level
39 distillations for public consumption. There is no one size fits all approach.
40 Increasingly the Center has moved in the direction of web-based information which

1 can work well for some consumers but is less effective in reaching much of the
2 public at large. While expensive and time consuming the development of simple
3 'Fact Sheets' and face to face outreach at public meetings such as ocean days, boat
4 shows, etc. would be valuable. The Center might also consider holding an 'Open
5 House' every 5 years to showcase its stock assessment and other activities. We have
6 found this to be an incredibly effective outreach tool in the past.

7 8 **Strengths**

- 9 • Strong communications with industry, PFMC, international organizations and
10 partners, and academia.
- 11 • Advice is communicated regularly to scientists by stakeholders.

12 13 **Challenges**

- 14 • Limited time/capacity to translate stock assessment results for the public
15 and non-scientific stakeholders.
- 16 • Potential conflict of interest in some stakeholder groups that may interfere
17 with communicating the best available science.
- 18 • Many collaborators are not local making face to face meetings difficult
19 especially given increasing travel restrictions.

20 21 **Recommendations to address issue**

- 22 • Creation of new SWFSC Stock Assessment webpage for ready access to all
23 SWFSC assessment documents.
- 24 • Consider utilizing more online Webex meetings.
- 25 • Make better use of existing resources (e.g. NOAA and outside partner
26 webpages, FishWatch)
- 27 • Consider participation in various public meetings and fora such as ocean
28 days, boat shows, outdoor shows, fishing tournaments, etc.

29 30 **Opportunities**

31
32 The SWFSC has done a commendable job of developing partnerships and alliances
33 with a variety of individuals and organizations to enhance its capacity to conduct
34 very quantitative and detailed stock assessments. While this is key to providing the
35 advice required by management to make decisions on harvest on an annual basis it
36 was noted repeatedly that there was insufficient time to adequately conduct this
37 research. Nevertheless, the Center has demonstrated a very extensive and
38 comprehensive publication record relating to assessment research. It was less clear
39 how the Center was interacting with other sections of NMFS with expertise in

1 environmental monitoring or ecosystem linkages. The Center could also consider
2 developing linkages to NOAA or university departments developing high technology
3 hardware to support future survey developments (automated fish measuring, net
4 mensuration, drones for aerial surveys, etc.).

5 6 **Strengths**

- 7 • Long history of robust assessments using reliable tools, including research
8 on ecosystem function and publication of results in scientific journals.
- 9 • Prioritization of assessments has been done in close collaboration with PFMC
10 (CPS, Groundfish) and ISC, WCPMC, IATTC (HMS) and research direction and
11 developments provided through associated reviews.
- 12 • Strong working relationships with stakeholders and industry (Collaborative
13 research, Trinational Sardine Forum, Tuna Conference)

14 15 **Challenges**

- 16 • Increasing requests for MSEs and ecosystem models that require additional
17 expertise.
- 18 • Securing resources for CSTAR, CAPAM in an era of shrinking resources and
19 for post-doctoral students to aid in assessment research.
- 20 • Incorporation of advanced technologies into assessments that will aid with
21 climate change and ecosystem effects.
- 22 • Ability to travel to attend international meetings and collaborate with
23 international colleagues.

24 25 **Recommendations to address issue**

- 26 • Attempt to fill vacancies with technical expertise in applied assessment skills
27 (e.g. MSEs, biological oceanographer, ecosystem modeler, climate effects).
- 28 • Continue to foster joint and stakeholder support for CSTAR and CAPAM to
29 create student training opportunities.
- 30 • Encourage co-operative research with universities and others on advanced
31 technologies including utilizing the new tank facility.

32 33 **Conclusions**

34
35 The SWFSC is doing a very effective job in meeting its stock assessment mandate.
36 The Center is applying a suite of assessment and modeling tools that represent the
37 standard in the practice and include some novel approaches that have been
38 developed internally by Center staff. In most cases, the assessment process is
39 efficient, effective and clearly described following the protocols set out by the PFMC
40 and SSC. In a limited number of cases there are issues related to data access from

1 partner jurisdictions or as a result of internal data management limitations. The
2 Center through its interaction with the SSC conducts an adequate although at times
3 too prescriptive peer review process that can result in unnecessary additional work
4 that does not better inform the assessment process. The Center's organization is
5 effective at accomplishing the required assessments although there may be a benefit
6 of more frequent interaction between staff at La Jolla and Santa Cruz. The adequacy
7 of funding is unclear given the uncertainty about assessment prioritization relative
8 to other Center mandates, i.e. how are funds for assessment work prioritized against
9 that for ESA species, or Environmental Ecosystem studies. However, it appears that
10 staff are overcommitted in terms of the number of assessments that are being
11 requested and so there is a need to fill any existing vacancies in this group with
12 additional analysts. Some issues remain around the prioritization of stocks but it
13 appears that all key assessments are being delivered and a reasonable prioritization
14 process has been developed to address some of the long outstanding assessment
15 shortfalls primarily for Groundfish and some CPS species. The Center is achieving its
16 mandate relative to assessments with adequate data. However, the species,
17 primarily Groundfish and some CPS for which data are limited are lagging although
18 this inadequacy is being addressed through planned assessments in the next few
19 years using data-poor or data-moderate approaches. The communication of
20 assessment program results is primarily through presentations at PFMC meetings or
21 other meetings with industry and through Web-based tools. Communications could
22 be strengthened through a number of other outreach activities including
23 participation in a variety of stakeholder and other public events. A concern is the
24 apparent decrease in funding for staff to participate in career development through
25 attendance at conferences where research results could be presented and
26 disseminated. The Center has been quite proactive in entertaining partnerships with
27 universities and through development of training opportunities through CSTAR and
28 CAPAM which have resulted in the development of new assessment tools. The
29 Center should encourage similar partnerships with university or other private
30 entities to develop new assessment technologies using the state of the art test tank.
31

1 **Panel Member Z**

2

3 **2014 SWFSC Fishery Stock Assessment Program Review**

4

5 **July 28 – Aug. 1, 2014**

6

7 **General Observations and Recommendations**

8

9 This review was well organized and presented and provided candid insights into the
10 development of fishery stock assessments for U.S. west coast and related highly
11 migratory species fisheries. The SWFSC staff did an excellent job of providing a
12 detailed overview of their fishery stock assessment program(s) and in identifying
13 the challenges they feel they face. The presentations were informative and
14 accessible. This was a successful way to conduct such a review.

15

16 The review benefitted greatly from the participation (and presentations) by staff
17 from the Pacific fishery management council, NOAA Fisheries west coast regional
18 office and Northwest Fisheries Science Center as well as from attendance and
19 comments from several representatives of commercial fishing organizations and the
20 Inter-American Tropical Tuna Commission (IATTC). Fishermen, conservationists,
21 academics, other agencies and the interested public, including public interest
22 groups, would benefit from attending these reviews. [The review was open to the
23 public and the results will be posted on the SWFSC website in good time.]

24

25 The SWFSC fishery stock assessment staff are dedicated and passionate (in a
26 positive manner) and they appear to have the latitude to express themselves freely,
27 which is a compliment for this type of review.

28

29 The relationship between the Science Center and the domestic management bodies
30 (in this case West Coast Regional Office (formerly the Southwest Regional Office
31 before it was consolidated with the Northwest Regional Office) and the Pacific
32 Fishery Management Council) appears to be collegial.

33

34 The Terms of Reference (TOR) for Groundfish and CPS (Coastal Pelagic Species)
35 stock assessments that guide the SWFSC relationship with the Pacific fisheries
36 management council appear quite prescriptive. To the extent this is a significant
37 problem for SWFSC staff or leadership was not apparent to this reviewer (there
38 appeared to be different opinions and there were suggestions (see below) for
39 increased flexibility in their application). Clearly the explicit Terms of Reference
40 (TOR) for Pacific coast stock assessments provide a firm grounding on process for

1 CPS and Groundfish assessments. It is also helpful in generating a common set of
2 expectations and practices. At the same time, it was apparent there are “off-cycle”
3 requests for assessment-related information that have an impact on the workload of
4 the SWFSC fishery stock assessment scientists.

5
6 The HMS (highly migratory species, primarily tunas, billfish and sharks) assessment
7 process is less prescriptive but dependent on consensus amongst the countries to
8 the ISC (the International Scientific Committee on Tuna and Tuna-like Species) that
9 conducts reviews of HMS species in the North Pacific. There is no “off year” for HMS
10 assessments given the current limited staffing of the SWFSC fishery stock
11 assessment program such that the tempo of activity on HMS assessments (which
12 include data compilation) appeared to allow little time for research.

13
14 The CPS and Groundfish stock assessment development process and timing
15 appeared to be dominated by the Pacific fishery management council’s STAR panels
16 which serve a dual role as assessment workshops and external peer reviews. There
17 were several suggestions that the time period for the STAR panels was too
18 compressed both in terms of the calendar year and the panel weeks themselves, and
19 that the intensity of these panel work periods appeared to preclude careful
20 reflection of the results, particularly for assessment models revised during the
21 review week, although the off-cycle year would appear to provide time for such
22 reflection on inputs, methods and results if there were few other commitments.

23
24 The HMS stock assessment process is an international working group approach
25 which has a similar tempo, and it too has a timing problem related to the plethora of
26 RFMO (regional fishery management organizations, the international fishery
27 management bodies) meetings in the Pacific.

28
29 Overall, the SWFSC appears to be well positioned in terms of its fishery stock
30 assessment responsibilities although increased staffing, or at least increased
31 flexibility in the fishery stock assessment process, would be beneficial.

32 33 34 **Key (Specific) Findings and Recommendations**

35
36 *[Most recommendations are identified by small circles following “findings”*
37 *discussion.]*
38
39
40

1 • **High-level scientific/technical approach**

2
3 It is clear that for all three species groups (Groundfish, CPS, and HMS), the
4 SWFSC fishery stock assessment staff have thoughtfully and
5 transparently considered the approach each takes to their assessments.
6 They are aware of appropriate practices in fishery management stock
7 assessment and have a reasonable amount (although this could be
8 enhanced) of interchange with academic population dynamics faculty for
9 exploring more advanced methods.

10
11 There was relatively little discussion of the actual modeling approaches
12 and choices, as opposed to the processes by which assessments are
13 generated and reviewed. While this was intended to be a review of
14 process, the process of determining modeling approaches is an important
15 decision. For Groundfish, the common Stock Synthesis platform is shared
16 with the Northwest Fisheries Science Center and is well understood.
17 Choices for the CPS and HMS could bear elaboration although the
18 advantages of a common platform approach were well enunciated for the
19 latter. Similarly, the availability of multi-country data for the latter two
20 sets of assessments also bears attention.

21
22 Staff mentioned the importance of attending professional meetings
23 (which given their formal stock assessment schedules is sometimes a
24 tight fit) as well as the importance of the NOAA Fisheries annual NSAW
25 (national stock assessment workshop). The SWFSC also clearly takes
26 advantage of, and contributes to, the NOAA Fisheries fish stock
27 assessment tool box, and this is a good opportunity for technical
28 interchange across NOAA Fisheries.

- 29
30 ○ Support for participation in these professional venues is to be
31 encouraged.

32
33 There was some discussion of involvement in the CSTAR program with
34 UC-Santa Cruz and the Scripps-SWFSC-IATTC CAPAM program. The value
35 of the CSTAR program was apparent but dependent on continuity of UC-
36 Santa Cruz academic leadership while the value of the CAPAM program
37 was a bit harder to determine but staff involved were enthusiastic.

- 38
39 ○ The SWFSC would do well to have a strategic approach for
40 enhancing relationships with nearby academic institutions.

1
2 Google Scholar searches revealed a good number of professional journal
3 articles by SWFSC fishery stock assessment staff. While meeting NOAA
4 Fisheries conservation and management mandates is a key deliverable,
5 publication in peer reviewed journals remains an important measure of
6 the technical strength of scientific endeavors. At the same time, writing
7 professional journal articles takes time which appears to be in short
8 supply.

- 9
10 ○ Publication in peer-reviewed professional journals is to be
11 encouraged, subject to balance in meeting fishery stock
12 assessment mandates.

13
14 • **Assessment process**

15
16 The CPS and Groundfish stock assessment process is highly “regulated”
17 by the Terms of Reference with the Pacific fishery management council.
18 This did not seem to be a problem to most of the SWFSC stock assessment
19 scientists involved, but from a reviewer’s perspective, the workload
20 appeared sufficiently considerable that it threatens to make assessments
21 less reflective than might be preferable. There is also the potential for
22 staff burn-out, turn-over, and staleness. However none was exhibited. Off-
23 cycle requests for supplementary assessment information by the Pacific
24 fishery management council would appear to erode the capability for
25 such reflection and research, and these requests should be managed
26 carefully.

27
28 The Pacific fishery management council's (and to a lesser extent the ISC's)
29 fishery assessment process requires a substantial degree of
30 documentation and reporting. In the case of benchmark (full)
31 assessments, this is probably unavoidable but it was not obvious this was
32 beneficial for update assessments.

- 33
34 ○ Ways to reduce unnecessary documentation and reporting, and
35 increasing flexibility in the updating of assessments, should be
36 explored with the Pacific fishery management council.

37
38 Updates and projections could incorporate the benchmark assessment
39 through reference, and both code and outputs should be provided to the
40 STAR panels (and CIE reviewers) in digital form. Greater flexibility in

1 accepting minor changes in modeling during updates, rather than
2 requiring the steps involved in a full assessment, would reduce the
3 reporting burden while not restricting the ability of the STAR panel to
4 adequately review of the assessments.

5
6 The HMS stock assessment process requires extensive involvement in
7 international working group meetings through the ISC, and as a result,
8 SWFSC staff travel extensively. This too would seem to be burdensome
9 although this was not voiced by the staff.

- 10
- 11 ○ The ISC should carefully consider its schedule of meetings.
- 12
- 13 ○ For both the Pacific fishery management council and the ISC, a
14 thorough evaluation of the timing of assessments, including
15 preferencing most recent year catch updates and projections
16 rather than completely new assessments, should be seriously
17 considered. It would also appear useful to have a process for
18 incorporating “ad hoc”, non-time-series information into
19 assessments where conditions on the ground appear to have
20 changed.
- 21

22 As one presenter noted, data exploration is a critical, and often more
23 time-consuming, aspect of fishery assessment. Clearly it is important that
24 the fishery stock assessment staff are knowledgeable about the actual
25 conditions in the fishery they are studying. It is also important that they
26 receive adequate support from fishery data management staff in the
27 assessment process. To what extent this is the case was not clear for any
28 of the species groups, and each expressed concern about the time spent in
29 developing data for their assessments. The multi-year effort by the
30 Groundfish stock assessment staff, in conjunction with data management
31 staff (presumably), to develop published time-series of information
32 relevant to the assessment and is a good model.

33
34 Report writing and documentation appear excessive and thus
35 burdensome although both are critical to the assessment review process.
36 The tendency for all types of organizations to move away from editorial
37 assistance is problematic.

- 38
- 39 ○ Editorial support to the SWFSC fishery stock assessment program,
40 particularly in terms of preparing prescriptive reports for the

1 Pacific fishery management council or the ISC should be
2 considered. Junior staff should also play a key role in report
3 preparation since that would also help them understand the
4 assessment better.

5
6 Finally, the activity tempo in terms of meetings is considerable. To a
7 certain extent this is a reality of contemporary fisheries management
8 process, both domestically and internationally.

- 9
10 ○ A well-researched investigation of on-line collaborative and
11 webinar tools should be conducted as a means to reduce travel
12 time.

13
14 • **Peer review**

15
16 The differences between the CPS/Groundfish assessment approach and
17 the HMS approach are quite stark in terms of the peer review process,
18 although it appears both have adequate review processes in place.

19
20 The CPS and Groundfish peer review process is mandated by the Terms of
21 Reference with the Pacific fishery management council process. These
22 reviews appear to have evolved from what could be termed a workshop
23 review in which reviewer comments were incorporated into the final
24 product during the one week STAR panels to one in which the basic
25 structure of the assessment is preserved to a certain extent. SWFSC staff
26 appeared happy with the latter development and expressed support for
27 the STAR panels.

28
29 The utilization of the Center for Independent Experts (CIE) in reviewing
30 the CPS and Groundfish stock assessments is an important approach for
31 insuring scientific integrity. At the same time, it appears that the CIE
32 reviewers are fully incorporated into the Pacific fishery management
33 council's STAR panels that essentially modify the assessments on the fly.
34 To this reviewer, the inclusion of the STAR panel and CIE reviewers into
35 modifying the CPS and Groundfish assessments as presented by the
36 SWFSC stock assessment team, while potentially helpful in developing a
37 better assessment, does not provide a truly independent review of the
38 final assessment. Nor, given the involvement of the Pacific fisheries
39 management council's scientific and statistical committee (SSC) in the

1 STAR panel, and NOAA Fisheries scientists on the SSC itself, can the SSC
2 provide this independent review.

- 3
- 4 ○ The Pacific fishery management council and the SWFSC should
5 review the role of the CIE in the STAR panels.
- 6

7 This problem could be easily overcome by “recusing” the CIE reviewer
8 from suggesting modifications to the stock assessment during the STAR
9 panel itself and/or using the CIE review (or the STAR panel review as
10 well) only as a “retrospective” look at the assessment whose
11 recommendations would be taken into account for the following
12 assessment (or update). The assessment analyst (and SSC) would have
13 time (weeks or months) to consider thoughtfully the review's
14 recommendations, and the appropriate recommendations could then be
15 taken into the following assessment (or update)

16

17 The SSC would still serve the statutory purpose of accepting or rejecting
18 the assessment based on the STAR panel and CIE reviews in the current
19 cycle.

20

21 For the HMS assessments, the use of the CIE fulfills this role adequately,
22 although it would be preferable if these reviews were in-person (but not
23 participatory), rather than desk reviews.

24

25 Publication of basic fishery assessment methods, such as the recent
26 Fisheries Research (May 2014) review of the data moderate methods, is
27 also an important aspect of peer review and scientific integrity.

28

- 29 • **Organization and priorities**

30

31 It appears that the three sets of SWFSC stock assessment scientists
32 intersect sufficiently even though they are in separate locations (La Jolla
33 and Santa Cruz) and separate programs. This is important for insuring
34 that the small staff has the opportunity to share knowledge and
35 experience. They are also closely associated with survey and fisheries
36 data management staff, although involvement of these latter types of staff
37 in the assessment process might enhance the productivity of the
38 assessment staff.

39

1 The SWFSC has undergone considerable leadership changes over the past
2 ten years, and its Fisheries Resources Division has had a more recent
3 change in leadership with an acting division chief currently in place.
4

- 5 ○ The SWFSC might benefit from a senior level person, potentially
6 the Fisheries Resources Division chief or the lead stock
7 assessment program leader, to be the primary liaison with the
8 management bodies. This would help provide a filter for
9 assignments from the management bodies as well as a key person
10 in planning and scheduling secondary work so that it does not
11 impinge on the assessment cycle.
12

13 Questions remain concerning the organization of fishery data compilation
14 and management activities, left over from the 2013 external review.
15 Undoubtedly this is a work in progress, and the development of
16 standardized groundfish time-series is an important accomplishment.
17

- 18 ○ Further follow-up to the 2013 SWFSC external review of fisheries
19 data is encouraged.
20

21 While the relationship with the Pacific fishery management council was
22 well described, the relationship between the HMS assessment team and
23 the two relevant RFMOs (the Inter-American Tropical Tuna Commission,
24 co-located in La Jolla, and the Western and Central Pacific Fishery
25 Commission, located in Pohnpei, Federated States of Micronesia) is more
26 complicated. There was relatively little discussion of the HMS stock
27 assessment team's interaction with the international components of the
28 NOAA Fisheries regional offices related to HMS management. This might
29 be problematic in terms of insuring that expectations of these
30 management bodies are clearly understood, and these management
31 bodies clearly understand the capabilities and reservations of SWFSC
32 staff in terms of HMS assessment activities. There was an interesting
33 comment from an HMS industry representative questioning the role of
34 the SWFSC in the Pacific fishery management council process related to
35 pelagic species.
36

37 Assessment prioritization needs to incorporate greater flexibility in
38 conservation and management approaches, both in terms of how
39 frequently to do assessments and in terms of incorporating recent year
40 information in an efficient manner. The current fisheries management

1 structure nationally, as well as on the Pacific coast, tends to try to wring
2 the last fish out of the stock: this makes every tweak in the assessment
3 appear to be critical. With a greater acceptance of the actual reality of
4 uncertainty in terms of knowledge of the underlying fish stocks and their
5 response to fishing (and environmental perturbation), the assessment
6 process could be more “orderly” and probably the management results
7 would be as well (in terms of reducing year-to-year changes, which as one
8 industry participant noted would be helpful to a consistent, long-term
9 investment horizon).

- 10
- 11 ○ The relationship between the new NOAA Fisheries fisheries stock
12 assessment prioritization process and the Pacific fishery
13 management council assessment cycle will merit attention.
- 14
- 15 ○ Priorities should also be clear on what responsibilities and
16 expectations are for Federally managed stocks versus monitored
17 and State managed stocks.
- 18
- 19 ○ There should also be a clear relationship between these priorities
20 and implementation of the Center’s strategic science plan (2013).
- 21

22 • **Accomplishments relative to mandates**

23

24 For a small core fishery stock assessment staff (7 principal assessment
25 scientists were identified) at the SWFSC, the workload, through-put, and
26 accomplishments are significant. Both the Pacific fishery management
27 council and the ISC seem pleased with the output of the SWFSC in each of
28 the three assessment areas.

29

30 The SWFSC fishery stock assessment scientists are also involved in a large
31 number of ancillary scientific and management meetings as depicted in
32 one of the wrap-up presentations. In one sense, this is reasonable since
33 the fishery stock assessment scientists are the staff closest in many ways
34 to NOAA Fisheries conservation and management mandates. On the other
35 hand, given the small number of SWFSC fishery stock assessment
36 scientists, this may not be a good use of high level Ph.D.’s. Ultimately this
37 is a question for SWFSC leadership to determine.

- 38
- 39 ○ A close examination of time spent in the diversity of non-
40 assessment meetings exhibited in this review (excluding of course

1 time spent in this review!) might be a good yardstick for future
2 planning.

3
4 • **Communication of assessment results and data needs**

5
6 The Pacific fishery management council and the ISC websites provide
7 (relatively) easy access to the core assessments and reviews. SWFSC staff
8 communicated clearly and was comfortable with the fishery
9 management, regional office, and industry representatives attending,
10 suggesting that inter-personal communication was also adequate.

- 11
12 ○ The Center’s website pages for the Fisheries Resources Division
13 should provide easy links to these assessments and reviews as
14 well as connections to published papers and the biographies and
15 resumes of the principal fisheries stock assessment staff.

16
17 Clearly a primary vehicle for communication of fishery assessment
18 results is presentation at the management bodies and their subsidiary
19 science committees. But there is more to building a “science
20 constituency.”

- 21
22 ○ The Center should consider a few key, target audiences for tailored
23 accessible (readable or viewable) communication, rather than
24 what would appear to be a broadcast approach that exists today.
25 This could take advantage of NOAA public relations staff and
26 science writer/producers to develop a public science process, such
27 as NOAA Fisheries’ “Stock Assessment 101” presentations and
28 Congressional videos on advanced sampling technology.
- 29
30 ○ Another approach would be to have an annual “open house” at a
31 Pacific fishery management council meeting, industry and
32 conservation group meetings or similar venues, as well as holding
33 meetings such as the SSC at the Center (either the La Jolla or Santa
34 Cruz facilities) that would include targeted public orientation to
35 stock assessment methodologies and approach outside the formal
36 meetings themselves.
- 37
38 ○ Yet another approach would be to provide a “distilled” version of
39 this review in on-line formats (e.g., PDFs of consolidated

1 presentations or videos of key presenters giving succinct
2 overviews of their presentations.

3
4 • **Opportunities**

- 5
- 6 ○ Focus on building and maintaining close relationships with the
7 academic community, particularly those institutions where
8 population dynamics or related empirical approaches are emphasized.
9
 - 10 ○ Identify methods for kick-starting fishery stock assessment careers
11 for undergraduates through active involvement in internship
12 programs and in funding graduate assistantships at near-by
13 universities.
 - 14
 - 15 ○ Provide “sabbaticals” for stock assessment staff of various durations
16 (from as short as 1-2 weeks at another NOAA fishery science center to
17 as long as a semester at an appropriate university).
 - 18

19 **Conclusions**

20

21 A review like this provides the opportunity for the reviewer to (re)examine
22 their own institution and practices. We hope that we have taken thoughts
23 from our own experiences and institutions and provide them where
24 appropriate as suggestions to the SWFSC, and only as suggestions since in
25 one week (actually three days) it is impossible to understand another
26 program fully. It depends on the leadership of the reviewed institution, as
27 well as its own culture of introspection and reaction, whether this will bear
28 fruit either as outlined or at least in reference to these thoughts.

29
30
31